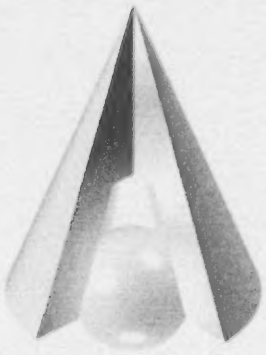
Catalogue no. 11F0019M — No. 347
ISSN 1205-9153
ISBN 978-1-100-21657-7

Research Paper

Analytical Studies Branch Research Paper Series

The Evolution of Canadian Wages over the Last Three Decades



by René Morissette, Garnett Picot and Yuqian Lu

Social Analysis Division
Ottawa, Ontario

Telephone: 1-800-263-1136

Statistics Canada Statistique Canada

Canada

How to obtain more information

For information about this product or the wide range of services and data available from Statistics Canada, visit our website, www.statcan.gc.ca.

You can also contact us by

email at infostats@statcan.gc.ca,

telephone, from Monday to Friday, 8:30 a.m. to 4:30 p.m., at the following toll-free numbers:

- Statistical Information Service 1-800-263-1136
- National telecommunications device for the hearing impaired 1-800-363-7629
- Fax line 1-877-287-4369

Depository Services Program

- Inquiries line 1-800-635-7943
- Fax line 1-800-565-7757

To access this product

This product, Catalogue no. 11F0019M, is available free in electronic format. To obtain a single issue, visit our website, www.statcan.gc.ca, and browse by "Key resource" > "Publications."

Standards of service to the public

Statistics Canada is committed to serving its clients in a prompt, reliable and courteous manner. To this end, Statistics Canada has developed standards of service that its employees observe. To obtain a copy of these service standards, please contact Statistics Canada toll-free at 1-800-263-1136. The service standards are also published on www.statcan.gc.ca under "About us" > "The agency" > "Providing services to Canadians."

Published by authority of the Minister responsible for Statistics Canada

© Minister of Industry, 2013

All rights reserved. Use of this publication is governed by the Statistics Canada Open Licence Agreement (http://www.statcan.gc.ca/reference/licence-eng.htm).

Cette publication est aussi disponible en français.

Note of appreciation

Canada owes the success of its statistical system to a long-standing partnership between Statistics Canada, the citizens of Canada, its businesses, governments and other institutions. Accurate and timely statistical information could not be produced without their continued co-operation and goodwill.

Standard symbols

The following symbols are used in Statistics Canada publications:

.	not available for any reference period
..	not available for a specific reference period
...	not applicable
0	true zero or a value rounded to zero
0[s]	value rounded to 0 (zero) where there is a meaningful distinction between true zero and the value that was rounded
p	preliminary
r	revised
x	suppressed to meet the confidentiality requirements of the *Statistics Act*
E	use with caution
F	too unreliable to be published
*	significantly different from reference category ($p < 0.05$)

The Evolution of Canadian Wages over the Last Three Decades

by

René Morissette, Garnett Picot and Yuqian Lu
Statistics Canada

11F0019M No. 347
ISSN 1205-9153
ISBN 978-1-100-21657-7

March 2013

Analytical Studies
Research Paper Series

The Analytical Studies Research Paper Series provides for the circulation, on a pre-publication basis, of research conducted by Analysis Branch staff, visiting Fellows and academic associates. The Analytical Studies Research Paper Series is intended to stimulate discussion on a variety of topics, including labour, business firm dynamics, pensions, agriculture, mortality, language, immigration, statistical computing and simulation. Readers of the series are encouraged to contact the authors with their comments and suggestions. A list of titles appears at the end of this document.

Papers in the series are distributed to research institutes, and specialty libraries. These papers can be accessed for free at www.statcan.gc.ca.

Publications Review Committee
Analysis Branch, Statistics Canada
24th Floor, R.H. Coats Building
Ottawa, Ontario K1A 0T6

Table of contents

Abstract **5**

Executive summary **6**

1 Introduction **8**

2 Data and concepts **10**

3 The evolution of the male–female wage gap **12**

4 The evolution of wage differences by age **19**

5 The wage gap between levels of education **27**

6 Changes in inter-industry wage differentials **34**

7 Changes in the occupational wage structure **42**

8 Conclusion **45**

9 Appendix **47**

9.1 Wage and hours concepts used in household surveys, 1981 to 2011 47

9.2 The wage gap between men and women in recent years 48

9.2.1 The gender wage gap in broadly comparable industries and occupations in 2011 48

9.2.2 The effect of using detailed occupation codes 49

References **52**

Abstract

This study examines how real wages of Canadian workers evolved from 1981 to 2011 across five dimensions: gender, age, education, industry, and occupation.

Keywords: wages, employment, wage differentials, pay rates, wage structure

Executive summary

This study examines how real wages of Canadian workers evolved from 1981 to 2011, with a focus on trends between 1981 to 1998 and 1998 to 2011. The main findings can be summarized as follows:

1. Although women today still earn relatively less than men on average, the gender hourly wage gap decreased significantly over the last three decades. Relative to men, women increased their productivity-enhancing characteristics at a faster pace than men did. Virtually all of the decline in the gender wage gap over the 1981-to-1998 period can be accounted for by this process. During the more recent 1998-to-2011 period, differential changes in education, job tenure, occupation, and union status accounted for about half of the narrowing of the gap;

2. From 1981 to 1998, average wages of men and women aged 45 to 54 grew roughly 20 percentage points faster than those of their counterparts aged 25 to 34. Differential changes in unionization, job tenure, industry of employment, and occupation explain about 40% of this difference for men and about 75% of this difference for women. In contrast, men and women aged 25 to 34 experienced faster wage growth than their counterparts aged 45 to 54 from 1998 to 2011. Changes in unionization, industry of employment, and occupation tended to favour young workers (relative to older ones) during that period and accounted for most of the difference in wage growth observed across age groups during that period. Over the entire 1981-to-2011 period, average wages of workers aged 25 to 34 grew by at least 15 percentage points less than those of workers aged 45 to 54;

3. After growing from 1980 to 2000, the wage gap between university- and high-school-educated individuals decreased from 2000 to 2011, especially among workers under age 35. This decline was driven by more rapidly rising wages among the less-educated, a reversal of the trend of earlier decades. The narrowing of the gap was associated with a shift in labour demand towards industries, such as mining, oil and gas extraction, and construction, which are less intensive users of highly-educated workers. Nevertheless, highly-educated workers, on average, still earn more than their less-educated counterparts;

4. Wage growth varied significantly across industries over the last 30 years. Most notably, the finance sector experienced much faster wage growth than other sectors during the 1981-to-1998 period. Most of this sector's wage growth was related to changes in worker characteristics and occupations within this sector, as upskilling appeared to be taking place. About one-half of the differences in wage growth between finance and construction—the sector that experienced the largest decline in wages during that period—was attributable to the more rapid acquisition in the finance sector of attributes associated with higher wages;

5. Movements in industry-level wages were quite different during the 1998-to-2011 period. Unlike in the 1981-to-1998 period, during which few industries posted robust wage growth, several industrial sectors experienced close to two-digit wage growth after 1998. Wages in the resource sector (mining and petroleum) grew the fastest, and virtually none of this growth was related to changes in worker or job characteristics. In contrast, the retail trade sector experienced weak wage growth. From 1981 to 2011, pay rates in this sector changed little;

6. In comparison with the other dimensions mentioned above, wage growth varied little across broad occupational groups from 1981 to 1998. However, during the first decade of this century, average wage growth for managerial occupations outpaced that observed in other aggregate occupational groups by a substantial margin. About 40% of wage growth in managerial occupations between 1998 and 2011 was due to changes in attributes associated with higher wages. Even after such changes were accounted for, managers continued to register the highest wage growth. Furthermore, only about one-quarter of the difference in wage growth between managers and workers in processing/manufacturing/utilities was attributable to changes in worker or job characteristics over the period.

1 Introduction

Hourly wages are a key driver of employment income and—since employment income is the main income source for most people—a major determinant of financial well-being. Differential wage growth influences the likelihood of different groups of individuals entering into or moving out of low income and has an effect on their capacity to handle unexpected expenditures. Furthermore, changes in group-specific wages inform discussions of the extent to which different groups of workers have shared in productivity and gross domestic product (GDP) growth in Canada over the last three decades.

In Canada and many other industrialized countries, the hourly wages of various groups of workers grew at markedly different rates over the last thirty years. A massive literature dating back to the mid-1980s has attempted to uncover why the pay rates of some workers grew faster than those of others. Technological changes, growth in international trade, institutional factors (e.g., de-unionization, changes in minimum wages, and changes in the incidence of pay-for-performance), movements in group-specific labour supplies, and changes in social norms have been cited as potential drivers of differential wage growth.[1]

While the relative importance of the aforementioned factors is still open to debate, two simple, but important, questions emerge:

1) Which groups of Canadian workers and which sectors of the Canadian economy experienced relatively stronger real-wage growth over the last three decades?

2) To what extent do individuals' acquisition of education, general work experience, and job tenure within firms, as well as their movements into low- or high-paying occupations and industries, account for the differences in real-wage growth observed across groups of workers?

This study focuses on how real wages of Canadian workers evolved from 1981 to 2011 across five dimensions: gender, age, education, industry, and occupation.

Previous research has documented several stylized facts regarding the evolution of wages by gender, age, and education. While women still earn relatively less than men on average, their wages grew faster than those of their male counterparts between 1981 and 2008 (Baker and Drolet 2010). Young workers lost ground relative to older workers during the 1980s and 1990s (Picot 1998; Morissette and Johnson 2005), but wage differences between the two groups stabilized between 1995 and 2005 (Boudarbat et al. 2010). Between 1980 and 2005, university graduates—especially men—experienced faster wage growth than high-school graduates (Boudarbat et al. 2010). What happened to the wages of men and women, young and older workers, and highly-educated and less-educated workers through the latter half of the 2000s is one of the issues addressed in this study.

In addition to updating wage trends across gender, age groups, and education levels, the study also examines wage trends across industries and occupations. Many questions arise in this regard. For instance, it is unclear whether wages in highly skilled services-producing industries (such as finance) grew in tandem with those in lower-skilled services-producing industries (such as retail trade) over the last three decades. Did the introduction of computer-based technologies coincide with a greater increase in the educational attainment of the workforce—and thus stronger wage growth—in the former group than in the latter? What happened to wages in textile, leather, and clothing as this sector faced growing international competition? How did wages evolve in mining and oil and gas extraction over the last decade, as world prices of oil

1. See Katz and Autor (1999), Card and DiNardo (2006), and Lemieux (2008) for syntheses of the various explanations put forward.

and minerals increased sharply? Did the relatively strong wage growth experienced by managers between the late 1990s and the mid-2000s, which was documented by Morissette (2008), persist in the subsequent years?

Apart from documenting the evolution of wages across the five aforementioned dimensions, the study investigates *why* some groups of workers, some industries, and some occupations experienced faster wage growth than others. It is well-known that education, work experience, and job tenure within a firm are positively correlated with wages. In addition, wages differ across industries and occupations for observationally equivalent workers. Hence, some groups of workers (e.g., women, older workers) may have experienced relatively strong wage growth because they increased, more than did other groups, their educational attainment, their work experience, and/or their job tenure with their employers. Part of their wage growth may also be accounted for by a relatively high propensity to be employed in high-paying industries and/or occupations. The study quantifies the importance of these factors—denoted below as *compositional effects*—in accounting for differences in wage growth across groups of workers, industries, and occupations.

In addition to compositional effects, other factors may have generated differential wage growth across groups of workers, industries, and occupations. These include shifts in labour demand or labour supply induced by changes in technology, consumer preferences, international trade, foreign direct investment, immigration, and group-specific preferences for leisure.[2] In addition, changes in labour market institutions (e.g., changes in unionization rates, in minimum wages, and in the incidence of pay-for-performance schemes), social norms, and labour market discrimination may have generated differences in wage growth between groups. Because identifying the causal impact of all these factors in a statistical analysis is a daunting task, this study makes no attempt at quantifying the contribution of these factors.[3]

The study pays particular attention to the first decade of the new millennium, which witnessed significant wage growth following two decades of pay stagnation between 1980 and 2000 (Plummer and Shannon 2011). Since Canada's unemployment rate was relatively low during much of the 2000s—reaching a low of 6.0% in 2007—and since wages of lower-skilled workers tend to increase when the unemployment rate reaches historically low levels (Mishel et al. 2009), the wage growth observed during the 2000s may have reduced wage differences between highly-educated workers and their counterparts with lower education or between workers employed in highly skilled occupations and other workers. Likewise, the recession of 2008/2009 may have affected pay rates of Canadian workers to a greater extent in some industries or occupations than in others.

2. For example, falling demand for manufactured goods (resulting from increases in the offshoring of manufacturing activities, a weak economy among Canada's trading partners, or the rising value of the Canadian dollar) may reduce employment and wages in manufacturing relative to other industries, thereby leading to slower wage growth (or greater wage declines) for manufacturing workers than for other workers. If the relative supply of highly-educated workers rises (as a result of rapidly rising numbers of Canadians receiving university degrees, or as a result of growing immigration by highly-educated workers), wages of university-educated workers may fall compared with those of other workers. Relatively low interest rates can boost demand for housing and labour demand for construction workers, thereby raising wages of construction workers relative to those of individuals employed in other industries. Increases in world oil prices may increase wages of workers employed in the oil extraction industry to a greater extent than is observed in other sectors of the economy.
3. Researchers who attempt to quantify the role of the aforementioned factors face several challenges: 1) technological change is unobserved in most conventional data sets; 2) technological change and international trade affect each other; 3) identifying the causal impact of changes in groups-specific labour supplies (e.g., young workers, university graduates, women, immigrants) requires strong assumptions about the degree of substitution between various groups of workers; 4) data on international trade by cells jointly defined in terms of commodity, industry, and country of origin is relatively scarce; and 5) measuring the impact of changes in social norms is a complex task. Furthermore, the relative contribution of these various factors may have differed across decades.

The study is organized as follows. Section 2 describes the data and concepts used in the paper. Sections 3, 4, and 5 analyze the evolution of wages across gender, age groups, and education levels, respectively. Sections 6 and 7 document wage growth across industries and occupations, respectively. Concluding remarks follow, in Section 8.

2 Data and concepts

The pay concept used throughout this study is the hourly wage. It is the best measure of direct remuneration since it is the purest price measure of labour services available in Canadian surveys. Differences in the quantity of labour provided—the number of hours worked per day, the number of days worked per week, or the number of weeks worked per year—can influence other measures often used, such as weekly or annual earnings.

Following Morissette and Johnson (2005), the study constructs a time series of hourly wages using several household surveys:

a) the Survey of Work History (SWH) of 1981;
b) the Survey of Union Membership (SUM) of 1984;
c) the Labour Market Activity Survey (LMAS) for the years 1986 to 1990; and
d) the Labour Force Survey (LFS) for the years 1997 to 2011.

All these surveys cover the same population, are based on the LFS sample design, and contain information on hourly wages received in the main job held by paid workers.[4] Together, they allow an assessment of the evolution of hourly wages from 1981 to 2011. This assessment is possible largely because the LFS started collecting hourly-wage data in 1997.[5]

Apart from hourly wages, all these surveys contain information on workers' age, job tenure—how long a worker has been employed in a given firm—educational attainment, union status, marital status, province of residence, industry, and occupation. These covariates are used throughout the paper to investigate the sources of differential real-wage growth across groups of workers.

Because the industry and occupation codes available in the data sets used for this study changed in the late 1990s—moving from the Standard Industrial Classification of 1980 (SIC 1980) and the Standard Occupational Classification of 1980 (SOC 1980) to the North American Industry Classification System of 2007 (NAICS 2007) and the National Occupational Classification for Statistics of 2006 (NOC-S 2006)—the evolution of wages is documented for two sub-periods: 1981 to 1998, and 1998 to 2011.[6] Although industry and occupation codes are

4. Workers' main job is the job with the greatest number of work hours per week.
5. In these surveys, hourly wages are obtained by dividing the job-specific earnings reported by respondents for a given time interval (e.g., one week, one month, one year) by the number of hours worked during this time interval. The question asked in order to obtain information about respondents' earnings refers to the "usual wage or salary before taxes and other deductions." As subsection 9.1 shows, some surveys use different earnings concepts or different hours concepts. For instance, the Labour Force Survey (LFS) explicitly includes tips and commissions in the calculation of earnings and explicitly excludes overtime in the calculation of work hours. In contrast, all surveys prior to 1987 make no explicit reference to tips or commissions when calculating earnings and make no explicit reference to overtime in the calculation of work hours. These differences should be kept in mind throughout the paper.
6. The Standard Industrial Classification of 1980 (SIC 1980) and the Standard Occupational Classification of 1980 (SOC 1980) were used in the Survey of Work History (SWH) of 1981, the Survey of Union Membership (SUM) of 1984, the Labour Market Activity Survey (LMAS) for the years 1986 to 1990, and some Tabs files of the LFS of 1997 and 1998. The North American Industry Classification System of 2007 (NAICS 2007) and the National Occupational Classification for Statistics of 2006 (NOC-S 2006) are currently used in all Tabs files of the LFS. The disaggregation of the last three decades into these two sub-periods is made possible because some Tabs files of the LFS of 1997 and 1998 have information on SIC 1980 and SOC 1980 while others have information on NAICS 2007 and NOC-S 2006.

not comparable between sub-periods, they are comparable within each sub-period. Whenever possible, trends are presented for the entire 30-year period, from 1981 to 2011.[7]

Unless otherwise noted, the sample consists of paid workers aged 17 to 64 who are employed full-time in the main job they held in May.[8] Attention is restricted to full-time jobs in order to analyze changes in the wage structure for a sample of relatively homogeneous jobs. Alternative samples focus on workers aged 25 to 54 and thus exclude younger workers who may be combining school and full-time employment and older workers who may be considering retirement. Throughout the study, hourly wages are expressed in constant 2010 dollars deflated using the Consumer Price Index (All items).

While remuneration per hour worked is an important job aspect, other aspects such as whether a job is covered by a registered pension plan (RPP) or whether a job is temporary also matter. These aspects are not covered in the current study, in order to keep the analysis manageable and also because microdata on RPP coverage and the incidence of temporary work is not available for the entire 1981-to-2011 period.[9]

The study relies heavily on decomposition methods to make inferences about factors that explain why some groups of workers experienced faster wage growth than others over the last three decades. When doing so, the study allows explanatory variables to be correlated with unobservable factors that affect wages, but it makes the assumption that the dependence structure between explanatory variables and unobservable factors is the same in the groups for which the decompositions are performed. For instance, when accounting for the narrowing of the gender wage gap, the study assumes that, while occupations (or education) are correlated with workers' ability, the selection biases associated with occupations (or education) are the same for men and women. Under this assumption, wage decompositions performed on men and women—or on young workers and their older counterparts—remain valid (Fortin et al. 2011, p. 6).

While the decomposition methods used in this study are useful for understanding differences in real-wage growth across groups of workers, they have certain limitations. One important limitation is that they ignore "general equilibrium" effects. For instance, job losses in one sector alter the alternative options available to all workers in a local labour market. For this reason, they may affect not only wages of workers in that industry but also wages of other workers employed in the same local labour market (Beaudry et al. 2011). In line with a vast literature in labour economics, this study makes no attempt at quantifying these effects.

Before analyzing how real wages grew across gender, age groups, education levels, industries, and occupations, it is important to understand how real wages evolved in the aggregate over the last three decades.

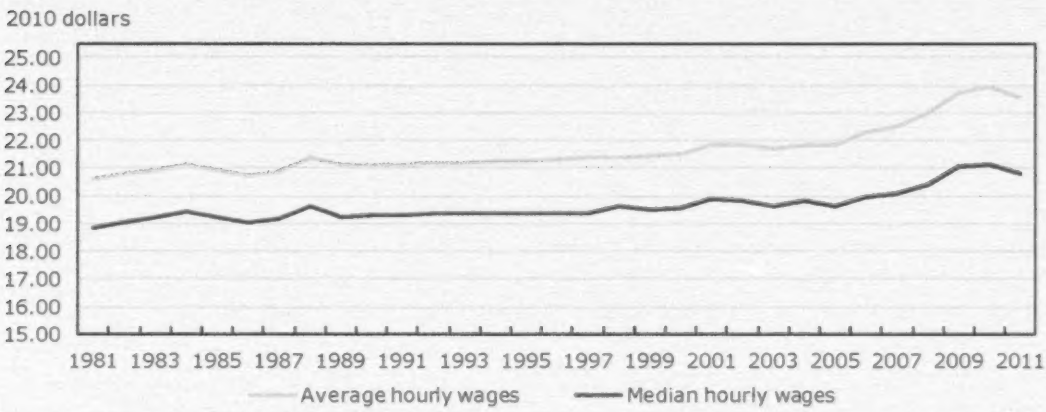
Chart 1 shows that the last three decades resulted in periods of markedly different real-wage growth. Average pay rates of Canadian workers grew slowly during the 1980s and 1990s, before rising at a faster pace during much of the 2000s. From 1981 to 1998, average real *hourly*

7. Readers should also note that, because education categories changed in the early 1990s, a consistent definition of education can be obtained from 1981 to 1998 only by comparing individuals who have a university degree with other individuals. More detailed education controls can be used from 1998 to 2011.
8. For 1984, the sample consists of full-time paid workers employed in their main job in December. To maximize sample sizes while having independent observations from the LFS, Section 5 uses samples of workers who are employed in their main job in March or September.
9. RPP coverage is available on a consistent basis from 1984 to 1998, using SWH 1981, SUM 1984, LMAS for the years 1986 to 1990, and the Survey of Labour and Income Dynamics (SLID) for the years 1993 to 1998. However, the wording of SLID questions regarding RPP coverage changed frequently after 1998, thereby raising issues of comparability over time. See Morissette and Ostrovsky (2006) for details. Indicators of temporary work are available from the General Social Surveys for the years 1989 and 1994 and from the LFS starting for the year 1997. See Cranford et al. (2003) and Morissette and Johnson (2005) for analyses of temporary work.

wages of full-time workers aged 17 to 64 increased by roughly 4%, less than half the 10% increase observed during the shorter, 1998-to-2011, period. Overall, average hourly wages of full-time workers increased by 14% from 1981 to 2011.

Chart 1

Real hourly wages of full-time workers aged 17 to 64, 1981 to 2011



Note: Estimates for 1982, 1983, 1985, and 1991 to 1996 are based on interpolations of data. Real hourly wages are obtained by dividing hourly wages by the Consumer Price Index (CPI).
Sources: Statistics Canada, 1981 Survey of Work History, 1984 Survey of Union Membership, 1986 to 1990 Labour Market Activity Survey, 1997 to 2011 Labour Force Survey, and Consumer Price Index (All-items).

3 The evolution of the male–female wage gap

Women have traditionally earned less than men on average, as documented by numerous studies (Doiron and Riddell 1994; Baker et al. 1995; Gunderson 1979; Drolet 2002; Fortin and Schirle 2006; Baker and Drolet 2010). In addition, Statistics Canada released for many years, until 2009, *Income Trends in Canada*, a publication that provided estimates of the male–female earnings gap.

There is a debate regarding what measure of earnings should be used when reporting this gap. The report mentioned above, *Income Trends in Canada*, has traditionally used the annual earnings of full-time, full-year workers. When applying the metric used in that report, it has been found that women's average earnings have been about 70% of those of men since 1992. However, Baker and Drolet (2010) made a convincing case that, with the availability of wage data from the LFS, comparisons based on hourly wages—rather than on annual earnings—are more appropriate. The reason is that gender differences in work hours may bias comparisons of annual or even weekly earnings. Using this metric, Baker and Drolet (2010) reported that women's average hourly wages were 85% of men's in 2008.

Following Baker and Drolet (2010), hourly wages are used in this section to measure differences in pay rates between men and women. Since the study seeks to document changes in the wage structure, the focus is on the *change* in the gender wage gap, particularly that which

has taken place since the late 1990s.[10] The analysis investigates the degree to which declines in the gender wage gap are attributable to differential changes in work experience, education, job tenure, industry, and occupations of men and women. Since union status, marital status, and province of residence are also potential determinants of wages, their influence is also taken into account in the multivariate analyses.

From 1981 to 2011, hourly wages of men increased modestly, with median wages and average wages growing by 5% and 11%, respectively (Table 1, Chart 2, and Chart 3). However, most of this growth took place after 2005, as men's hourly wages remained largely unchanged from 1981 to 2005.

Table 1
Real hourly wages (2010 dollars) of men and women aged 17 to 64 employed full-time, 1981 to 2011

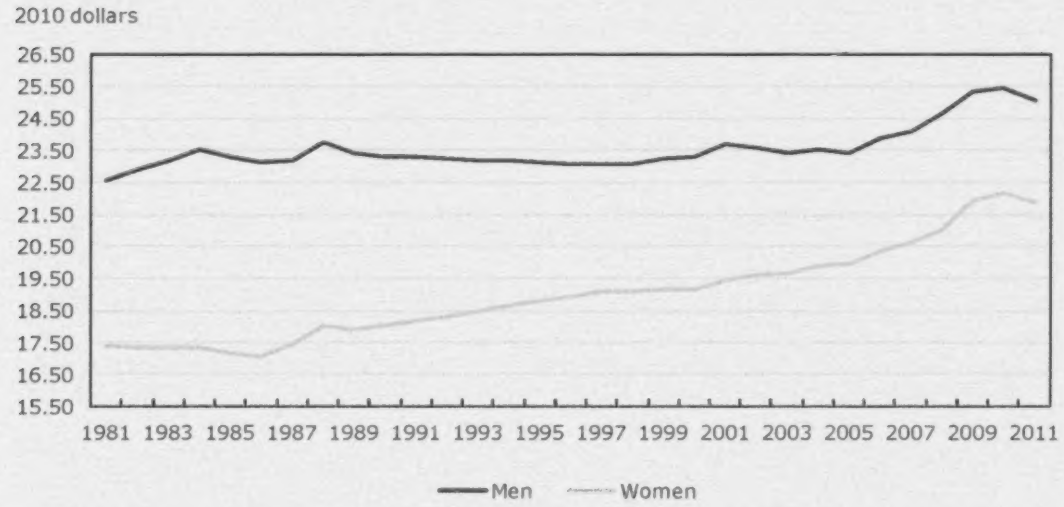
	Median hourly wages			Average hourly wages		
	Men	Women	Column 2 divided by Column 1	Men	Women	Column 5 divided by Column 4
	Column 1	Column 2	Column 3	Column 4	Column 5	Column 6
	dollars		ratio	dollars		ratio
Year						
1981	21.18	15.72	0.742	22.55	17.38	0.771
1984	22.42	16.13	0.720	23.51	17.35	0.738
1986	21.58	15.86	0.735	23.10	17.05	0.738
1987	21.89	15.97	0.730	23.20	17.44	0.752
1988	22.17	16.36	0.738	23.75	18.01	0.758
1989	21.80	16.29	0.747	23.42	17.89	0.764
1990	21.86	16.35	0.748	23.31	18.03	0.774
1997	21.59	17.54	0.813	23.05	19.09	0.828
1998	21.54	17.58	0.816	23.06	19.10	0.828
1999	21.32	17.56	0.824	23.23	19.13	0.824
2000	21.68	17.61	0.812	23.27	19.16	0.823
2001	21.53	17.71	0.823	23.68	19.43	0.821
2002	21.51	17.67	0.822	23.57	19.63	0.833
2003	21.42	17.83	0.832	23.38	19.66	0.841
2004	21.40	17.80	0.832	23.51	19.89	0.846
2005	21.46	17.94	0.836	23.41	19.96	0.853
2006	21.36	18.15	0.850	23.88	20.33	0.851
2007	21.59	18.37	0.851	24.06	20.65	0.858
2008	21.99	18.74	0.852	24.66	21.00	0.852
2009	22.53	19.58	0.869	25.33	21.93	0.866
2010	23.00	19.84	0.863	25.42	22.17	0.872
2011	22.27	19.37	0.870	25.03	21.85	0.873
			percent change			
Period						
1981 to 2001	1.6	12.7	...	5.0	11.8	...
2001 to 2011	3.5	9.3	...	5.7	12.4	...
1981 to 2011	5.1	23.2	...	11.0	25.7	...
1981 to 1998	1.7	11.8	...	2.3	9.9	...
1998 to 2011	3.4	10.1	...	8.5	14.4	...

Sources: Statistics Canada, 1981 Survey of Work History, 1984 Survey of Union Membership, 1986 to 1990 Labour Market Activity Survey, 1997 to 2011 Labour Force Survey, and Consumer Price Index (All-items).

10. Contrary to Baker and Drolet (2010), who analyzed the evolution of the gender wage gap from 1981 to 2008 using a single set of industry and occupation controls, regression analyses are performed for two distinct sub-periods: 1981-to-1998 and 1998-to-2011. Separating the 1981-to-2011 period into these two sub-periods allows the use of two sets of industry and occupation controls that are more detailed than those used by Baker and Drolet (2010). This in turn allows one to explain a higher fraction of the gender wage gap observed during the late 2000s than Baker and Drolet (2010) did. See subsection 9.2 for details.

Chart 2

Average real hourly wages of men and women employed full-time, 1981 to 2011



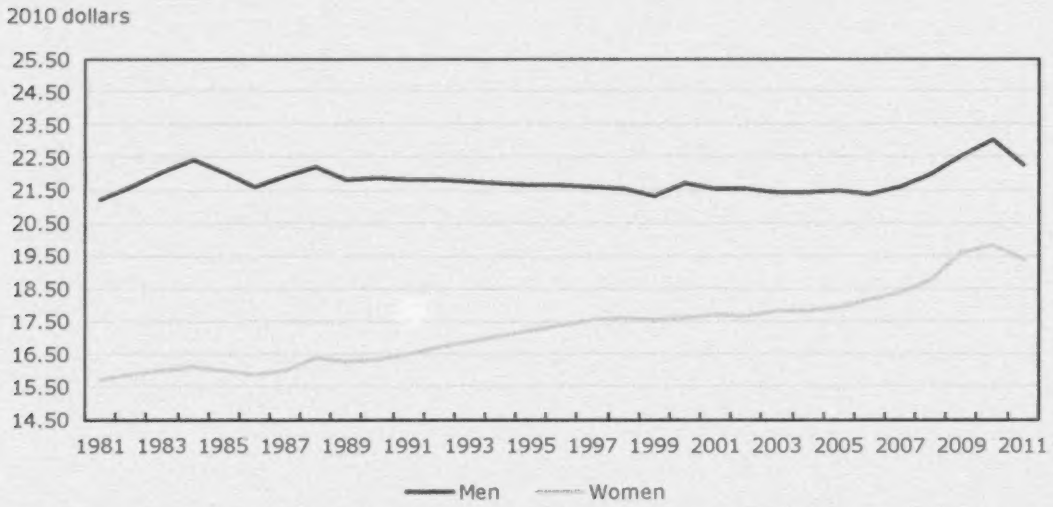
Note: Estimates for 1982, 1983, 1985, and 1991 to 1996 are based on interpolations of data. Real hourly wages are obtained by dividing hourly wages by the Consumer Price Index (CPI).
Sources: Statistics Canada, 1981 Survey of Work History, 1984 Survey of Union Membership, 1986 to 1990 Labour Market Activity Survey, 1997 to 2011 Labour Force Survey, and Consumer Price Index (All-items).

In contrast, women's median and average wages grew substantially faster between 1981 and 2011, increasing by 23% and 26%, respectively. As a result, the male–female hourly wage gap narrowed. In 1981, women aged 17 to 64 employed full-time had average hourly wages that were 77% of those of men; in 2011, the corresponding figure was 87% (Chart 4). However, these results are based on raw data. When gender differences in industry, occupation, education, age, job tenure, province of residence, marital status, and union status are taken into account, women' wages amounted to 92% of men's in 2011 (See subsection 9.2).[11] Among full-time workers aged 25 to 54, the corresponding number was 91%.

11. Readers should keep in mind that gender differences in industry and occupation may result either from gender differences in preferences or from sectoral and occupational segregation.

Chart 3

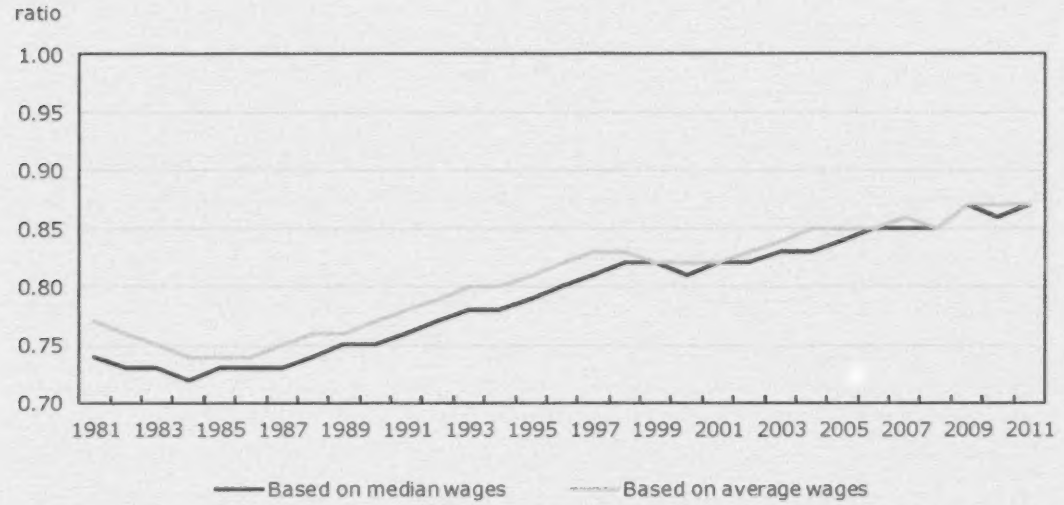
Median real hourly wages of men and women employed full-time, 1981 to 2011



Note: Estimates for 1982, 1983, 1985, and 1991 to 1996 are based on interpolations of data. Real hourly wages are obtained by dividing hourly wages by the Consumer Price Index (CPI).
Sources: Statistics Canada, 1981 Survey of Work History, 1984 Survey of Union Membership, 1986 to 1990 Labour Market Activity Survey, 1997 to 2011 Labour Force Survey, and Consumer Price Index (All-items).

Chart 4

Ratio of female–male real hourly wages, men and women employed full-time, 1981 to 2011



Note: Estimates for 1982, 1983, 1985, and 1991 to 1996 are based on interpolations of data. Real hourly wages are obtained by dividing hourly wages by the Consumer Price Index (CPI).
Sources: Statistics Canada, 1981 Survey of Work History, 1984 Survey of Union Membership, 1986 to 1990 Labour Market Activity Survey, 1997 to 2011 Labour Force Survey, and Consumer Price Index (All-items).

Using raw data, the paper finds that the gender wage gap based on medians decreased by half over the last three decades, dropping from 26% to 13% between 1981 and 2011. When using averages, the paper finds that the gender wage gap decreased from 23% to 13%.[12] A similar decline is observed for men and women aged 25 to 54 (Table 24).

Considering the 1981-to-1998 and 1998-to-2011 periods (each of which has consistent industry and occupation codes), one finds that more than half of the narrowing of the gender wage gap took place from 1981 to 1998 (Table 1 and Table 24). Why did the hourly wages of men and women tend to converge?

Part of the answer lies in the changing characteristics of female workers (tables 2 and 3). In both periods, women increased their average level of job tenure to a greater extent than men. For example, between 1981 and 1998, the average job tenure of women aged 17 to 64 increased by 25.6 months whereas men's grew by 3.5 months. The educational attainment of women also increased more than that of men, as did their presence in high-wage industries (such as public services). Furthermore, women moved away from low-paying occupations (such as clerical jobs) and into high-paying occupations (such as those in health, social sciences, education, and government service) to a greater extent than men. Finally, women experienced smaller declines in unionization than men.

Table 2

Descriptive statistics for men and women employed full-time — Change in selected characteristics from 1981 to 1998

	Men			Women		
	1981	1998	Change	1981	1998	Change
Workers aged 17 to 64						
Average tenure (months)	98.7	102.2	3.5	68.6	94.2	25.6
Percent with a university degree	13.5	19.4	5.9	10.7	20.4	9.7
Percent unionized	43.4	33.0	-10.4	34.5	31.3	-3.2
Percent in consumer services	13.4	16.7	3.3	21.8	22.8	1.0
Percent in public services	18.3	16.6	-1.7	33.1	35.1	2.0
Percent in clerical occupations	7.4	6.1	-1.3	38.3	26.9	-11.4
Workers aged 25 to 54						
Average tenure (months)	100.8	105.3	4.5	74.3	98.5	24.2
Percent with a university degree	16.6	21.5	4.9	13.6	22.3	8.7
Percent unionized	45.5	35.0	-10.5	37.9	33.5	-4.4
Percent in consumer services	11.9	15.1	3.2	18.9	20.3	1.4
Percent in public services	19.8	17.5	-2.3	36.7	37.0	0.3
Percent in clerical occupations	7.1	5.9	-1.2	35.6	26.9	-8.7

Sources: Statistics Canada, 1981 Survey of Work History and 1998 Labour Force Survey.

12. Regardless of the metric used, most of the decline in the gender wage gap is found to have occurred starting in the early 1990s (Chart 4).

Table 3
Descriptive statistics for men and women employed full-time — Change in selected characteristics from 1998 to 2011

	Men			Women		
	1998	2011	Change	1998	2011	Change
Workers aged 17 to 64						
Average tenure (months)	102.2	99.9	-2.3	94.2	101.3	7.1
Percent with a university degree	19.4	24.6	5.2	20.4	29.9	9.5
Percent unionized	33.0	29.7	-3.3	31.3	33.1	1.8
Percent in health occupations	1.5	1.9	0.3	8.9	11.7	2.8
Percent in occupations in social sciences, education, and government service	5.2	5.3	0.1	11.2	14.5	3.3
Workers aged 25 to 54						
Average tenure (months)	105.3	97.0	-8.3	98.5	98.7	0.2
Percent with a university degree	21.5	27.0	5.5	22.3	33.4	11.1
Percent unionized	35.0	30.6	-4.4	33.5	34.6	1.1
Percent in health occupations	1.6	2.0	0.4	9.3	12.3	3.0
Percent in occupations in social sciences, education, and government service	5.7	5.6	-0.1	11.9	15.4	3.5

Source: Statistics Canada, 1998 to 2011 Labour Force Survey.

Table 4 quantifies the contribution of these factors to the narrowing of the gender wage gap.[13] Between 1981 and 1998, changes in job tenure, industry, and occupation were the major contributors, accounting for 91.0% of the narrowing of the gap between male and female workers aged 17 to 64 and for 95.9% of the narrowing of the gap between male and female workers aged 25 to 54.[14] Differential changes in educational attainment and unionization account for an additional 21.6% of the narrowing of the gap between male and female workers aged 17 to 64 and for an additional 18.8% of the narrowing of the gap between male and female workers aged 25 to 54. Changes in unionization played a fairly minor role. Overall, differential changes in education, job tenure, industry, and occupation account fully for the narrowing of the gender wage gap observed between 1981 and 1998.[15]

13. The results are based on the dynamic Blinder-Oaxaca decomposition outlined by Baker and Drolet (2010, p. 450).
14. Among workers aged 17 to 64, the gender wage gap narrowed by 0.073 log points. Roughly speaking, this corresponds to a narrowing of the gap by about 7 percentage points.
15. Because observed factors—e.g., changes in the provincial distribution of employment—and unobserved factors tended to widen the wage gap between men and women between 1981 and 1998, the total contribution of changes in job tenure, industry, occupation, educational attainment, and unionization in narrowing the gender wage gap exceeds 100%.

Table 4
Dynamic Blinder-Oaxaca decompositions of the narrowing of the gender log wage gap

	Workers aged 17 to 64		Workers aged 25 to 54	
	Column 1	Column 2	Column 3	Column 4
	number	percent	number	percent
1981-to-1998 change in the gender log wage gap	-0.073	100.0	-0.072	100.0
Portion explained by				
Age	-0.005	6.7	0.004	-5.6
Education	-0.011	15.8	-0.011	15.0
Province	0.002	-2.5	0.004	-4.9
Union status	-0.004	5.8	-0.003	3.8
Marital status	-0.006	8.6	-0.009	13.2
Tenure	-0.027	37.6	-0.026	36.1
Occupation	-0.020	27.1	-0.022	31.0
Industry	-0.019	26.3	-0.021	28.7
Total portion explained	-0.091	125.4	-0.084	117.3
Portion unexplained	0.018	-25.4	0.012	-17.3
1998-to-2011 change in the gender log wage gap	-0.056	100.0	-0.060	100.0
Portion explained by				
Age	0.002	-2.8	0.002	-3.1
Education	-0.006	10.5	-0.008	14.1
Province	0.003	-4.6	0.003	-4.8
Union status	-0.006	11.4	-0.007	11.5
Marital status	-0.001	1.3	-0.001	1.9
Tenure	-0.004	7.3	-0.004	6.4
Occupation	-0.010	18.0	-0.014	23.5
Industry	0.002	-2.8	0.000	0.7
Total portion explained	-0.021	38.4	-0.030	50.3
Portion unexplained	-0.035	61.6	-0.030	49.7

Sources: Statistics Canada, authors' calculations based on the 1981 Survey of Work History and the 1998 to 2011 Labour Force Survey.

While differential changes in industry were a major source of wage convergence between 1981 and 1998, they were not an important factor from 1998 to 2011. During the latter period, differential changes in job tenure, educational attainment, occupation, and unionization further reduced the gender wage gap, although their overall impact was more limited than it was between 1981 and 1998. Indeed, these four factors reduced the gender wage gap by close to 0.03 log points—roughly 3 percentage points—from 1998 to 2011, compared with 0.06 log points—roughly 6 percentage points—from 1981 to 1998 (Table 4). As a result, these factors account for most (85%) of the narrowing of the gender wage gap between 1981 and 1998, but for about half between 1998 and 2011.

Summary

Male–female differences in hourly wages have narrowed considerably since the early 1980s, as the hourly wages of women grew at a faster rate than those of men. The growing propensity of women to obtain higher education, remain in their jobs longer, and work in high-paying industries and occupations accounted for all of the convergence observed between 1981 and 1998. Subsequently, differential changes in education, job tenure, occupation, and union status accounted for about half of the observed improvement between 1998 and 2011. This in turn

implies that other factors, not observed in the data sets used for this study, also contributed to the convergence observed through the 2000s.[16]

4 The evolution of wage differences by age

In addition to the narrowing of the male–female hourly wage gap, other changes in Canadian wages occurred in the 1980s and 1990s. One of these was the increasing dispersion of male wages, particularly across age groups, as the wages of young men fell relative to those of older men (Morissette 1998; Picot 1998).

Beaudry and Green (2000) examined this phenomenon from a cohort perspective and concluded that, from 1978 to the mid-1990s, earnings fell for each successive cohort of young men entering the labour market. This pattern was observed among both young men with lower education levels and their more highly-educated counterparts. Furthermore, as young men entering the labour market in the 1980s and early 1990s aged and acquired more experience, there was little evidence of earnings "catch-up." In other words, the evidence was consistent with a downward shift in the age–earnings profile of young men, with no steepening of the age–earnings profile. No satisfactory explanation for these facts has been presented so far.[17]

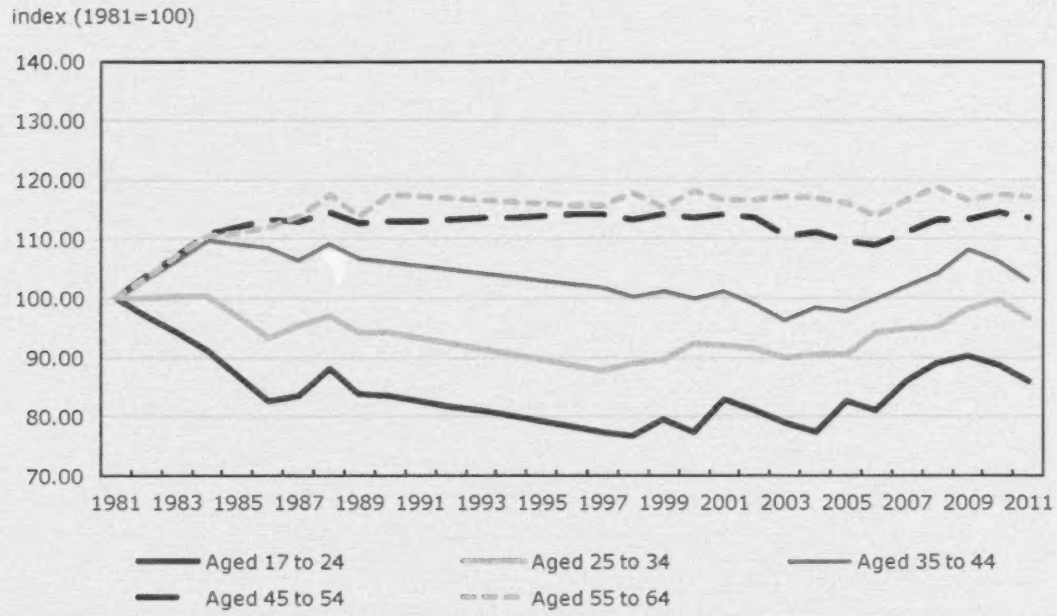
Quite different patterns were observed among women. Beaudry and Green (2000) found little evidence of a downward shift in the age–earnings profile of young women over the period considered. Using a time series of cross-sectional data, Picot (1998) showed that age-related earnings differences increased among women during the 1980s and early 1990s, but did so to a much lesser extent than among men. Furthermore, the growing age–earnings differences found among men resulted from a decline in the earnings of young men combined with an increase in the earnings of older men. In contrast, age–earnings differences among women resulted from faster earnings growth among older than younger women, although both groups experienced increases.

Following a period of decline, wages of young workers recovered in the 2000s. Median real wages of men aged 25 to 34 declined by about 10% between 1981 and the late 1990s, remained fairly constant until 2005, and increased afterwards, returning to their 1981 level by 2010 (Chart 5). Among men aged 17 to 24, the decline in median wages between 1981 and the late 1990s was larger, at over 20%, and the recovery by the end of the period was only partial. Meanwhile, wages of men aged 45 to 54 rose by about 10% in the early 1980s and have been fairly stable since then.[18] As a result, the difference in median real wages between men aged 25 to 34 and men aged 45 to 54 widened from 2% in 1981 to 23% in 1998, and then narrowed to 17% in 2011 (Table 5).[19] The corresponding numbers based on averages are 5%, 24%, and 18%.

16. The increased participation of female university graduates in high-paying fields of study—a dimension unobserved in the data sets used in this study—is one of the unmeasured factors that may have tended to narrow gender wage differences.
17. More recently, Boudarbat et al. (2010) documented some recovery in the wages of young men between 2000 and 2005.
18. A similar pattern is observed among men aged 55 to 64.
19. The data used in this study suggest that age–wage differences increased mainly during the early 1980s. Data from the Survey of Consumer Finances show a more continuous increase in age–earnings differences between 1981 and the mid-1990s (Morissette 1998; Picot 1998). However, both sets of data show a significant increase in age–earnings differences from 1981 to the mid-1990s.

Chart 5

Index of median real hourly wages by age, 1981 to 2011 (1981=100) — Men employed full-time



Note: Estimates for 1982, 1983, 1985, and 1991 to 1996 are based on interpolations of data. Real hourly wages are obtained by dividing hourly wages by the Consumer Price Index (CPI).
Sources: Statistics Canada, 1981 Survey of Work History, 1984 Survey of Union Membership, 1986 to 1990 Labour Market Activity Survey, 1997 to 2011 Labour Force Survey, and Consumer Price Index (All-items).

Table 5
Real hourly wages (2010 dollars) of men employed full-time, by age, 1981 to 2011

	Age group					Column 2 divided by Column 4
	17 to 24	25 to 34	35 to 44	45 to 54	55 to 64	
	Column 1	Column 2	Column 3	Column 4	Column 5	Column 6
	dollars					ratio
Median hourly wages						
Year						
1981	15.79	22.03	23.54	22.57	20.64	0.98
1989	13.24	20.76	25.09	25.39	23.52	0.82
1998	12.12	19.63	23.61	25.56	24.30	0.77
2001	13.10	20.25	23.82	25.77	24.05	0.79
2008	14.04	20.94	24.50	25.53	24.50	0.82
2011	13.56	21.30	24.21	25.60	24.21	0.83
	percent change					
Period						
1981 to 2001	-17.0	-8.1	1.2	14.2	16.5	...
2001 to 2011	3.5	5.2	1.6	-0.6	0.7	...
1981 to 2011	-14.2	-3.3	2.9	13.4	17.3	...
1981 to 1998	-23.2	-10.9	0.3	13.2	17.7	...
1998 to 2011	11.8	8.5	2.5	0.2	-0.4	...
	dollars					ratio
Average hourly wages						
Year						
1981	17.19	22.95	25.33	24.25	22.63	0.95
1989	14.57	21.80	26.69	27.45	26.24	0.79
1998	13.29	21.05	24.81	27.55	25.96	0.76
2001	14.16	22.08	25.43	27.53	26.29	0.80
2008	14.96	23.17	26.52	27.97	27.06	0.83
2011	14.92	23.18	26.77	28.44	27.28	0.82
	percent change					
Period						
1981 to 2001	-17.6	-3.8	0.4	13.5	16.2	...
2001 to 2011	5.3	5.0	5.3	3.3	3.7	...
1981 to 2011	-13.2	1.0	5.7	17.3	20.5	...
1981 to 1998	-22.7	-8.3	-2.1	13.6	14.7	...
1998 to 2011	12.2	10.1	7.9	3.2	5.1	...

Sources: Statistics Canada, 1981 Survey of Work History, 1984 Survey of Union Membership, 1986 to 1990 Labour Market Activity Survey, 1997 to 2011 Labour Force Survey, and Consumer Price Index (All-items).

As with men, wage growth among women varied according to age group between 1981 and 1998. While median and average wages of women aged 25 to 34 changed little over this period, those of women aged 45 to 54 grew by at least 20% (Table 6 and Chart 6). From 1998 to 2011, wages of women aged 25 to 34 grew slightly faster (i.e., by roughly 3 percentage points) than those of women aged 45 to 54. In sum, wages of men and women aged 45 to 54 grew faster than wages of their younger counterparts from 1981 to 1998 and slower from 1998 to 2011 (Chart 7).[20]

20. A similar conclusion holds when comparing wage growth of men aged 55 to 64 to that of men aged 17 to 24.

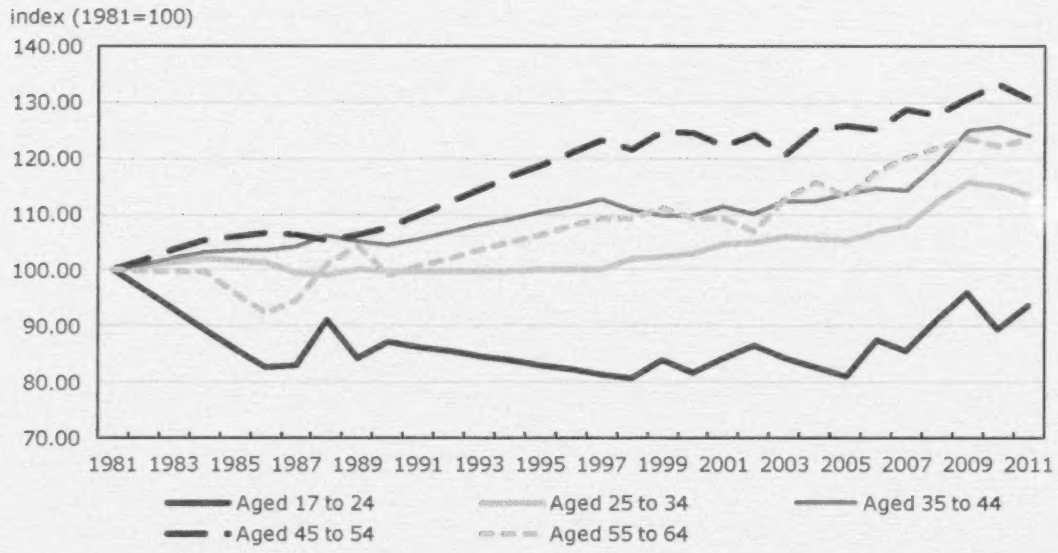
Table 6
Real hourly wages (2010 dollars) of women employed full-time, by age, 1981 to 2011

	Age group					Column 2 divided by Column 4
	17 to 24	25 to 34	35 to 44	45 to 54	55 to 64	
	Column 1	Column 2	Column 3	Column 4	Column 5	Column 6
			dollars			ratio
Median hourly wages						
Year						
1981	13.44	17.09	17.13	15.98	16.36	1.07
1989	11.34	17.13	18.04	16.98	17.09	1.01
1998	10.85	17.46	18.97	19.42	17.86	0.90
2001	11.32	17.87	19.06	19.55	17.87	0.91
2008	12.25	19.14	20.42	20.42	19.91	0.94
2011	12.57	19.37	21.22	20.86	20.22	0.93
			percent change			
Period						
1981 to 2001	-15.8	4.6	11.2	22.3	9.2	...
2001 to 2011	11.1	8.4	11.4	6.7	13.1	...
1981 to 2011	-6.5	13.3	23.9	30.5	23.6	...
1981 to 1998	-19.3	2.2	10.7	21.5	9.2	...
1998 to 2011	15.9	10.9	11.9	7.4	13.2	...
			dollars			ratio
Average hourly wages						
Year						
1981	14.42	18.49	19.07	17.64	17.81	1.05
1989	12.82	18.16	20.18	18.64	18.37	0.97
1998	12.12	18.55	20.41	21.22	19.50	0.87
2001	12.58	19.27	20.64	21.29	20.15	0.91
2008	13.62	20.64	22.28	22.73	22.54	0.91
2011	13.85	21.11	23.82	23.41	23.12	0.90
			percent change			
Period						
1981 to 2001	-12.8	4.3	8.2	20.7	13.1	...
2001 to 2011	10.1	9.5	15.4	9.9	14.7	...
1981 to 2011	-3.9	14.2	24.9	32.7	29.8	...
1981 to 1998	-15.9	0.4	7.0	20.3	9.5	...
1998 to 2011	14.2	13.8	16.7	10.3	18.5	...

Sources: Statistics Canada, 1981 Survey of Work History, 1984 Survey of Union Membership, 1986 to 1990 Labour Market Activity Survey, 1997 to 2011 Labour Force Survey, and Consumer Price Index (All-items).

Chart 6

Index of median real hourly wages by age, 1981 to 2011 (1981=100) — Women employed full-time



Note: Estimates for 1982, 1983, 1985, and 1991 to 1996 are based on interpolations of data. Real hourly wages are obtained by dividing hourly wages by the Consumer Price Index (CPI).
Sources: Statistics Canada, 1981 Survey of Work History, 1984 Survey of Union Membership, 1986 to 1990 Labour Market Activity Survey, 1997 to 2011 Labour Force Survey, and Consumer Price Index (All-items).

Chart 7

Percent change in average real hourly wages by sex and age, 1981 to 1998 and 1998 to 2011

Note: Real hourly wages are obtained by dividing hourly wages by the Consumer Price Index (CPI).
Sources: Statistics Canada, 1981 Survey of Work History, 1984 Survey of Union Membership, 1986 to 1990 Labour Market Activity Survey, 1997 to 2011 Labour Force Survey, and Consumer Price Index (All-items).

Tables 7 and 8 illustrate why this happened. From 1981 to 1998, the unionization rates of young men and women decreased substantially—by at least 12 percentage points—while those of men and women aged 45 to 54 either dropped slightly or increased.[21] Young workers' average job tenure fell whereas older workers' (especially older women's) job tenure increased. Young workers moved away from higher-wage sectors such as public services while older workers increased their presence in this sector. Finally, young workers' presence in higher-wage occupations (such as those in natural and social sciences) grew less than that of older workers. These compositional effects accounted for about 40% of the widening of the wage gap between younger and older men during the period and for about three-quarters of the widening of the wage gap between younger and older women.[22]

Table 7
Descriptive statistics for full-time workers aged 25 to 34 and aged 45 to 54 — Change in selected characteristics from 1981 to 1998

	Workers aged 25 to 34			Workers aged 45 to 54		
	1981	1998	Change	1981	1998	Change
Men						
Average tenure (months)	60.7	51.3	-9.3	162.8	170.1	7.3
Percent with a university degree	18.2	23.2	5.0	11.9	22.2	10.3
Percent unionized	43.5	25.0	-18.5	48.3	45.8	-2.5
Percent in consumer services	13.8	19.4	5.6	9.1	11.5	2.4
Percent in public services	17.6	12.2	-5.4	22.7	25.4	2.7
Percent in manufacturing	26.1	25.7	-0.4	29.8	26.4	-3.4
Percent in natural and social sciences	15.7	16.5	0.8	10.7	16.9	6.2
Percent in clerical occupations	7.6	5.6	-2.0	6.9	6.3	-0.6
Percent in managerial positions	5.4	4.3	-1.1	4.8	5.9	1.1
Women						
Average tenure (months)	55.1	52.8	-2.3	103.8	146.8	43.0
Percent with a university degree	16.6	28.4	11.8	8.5	19.6	11.1
Percent unionized	36.5	24.3	-12.2	37.0	42.3	5.3
Percent in consumer services	18.3	24.6	6.3	22.1	16.6	-5.5
Percent in public services	36.2	29.4	-6.7	36.3	46.4	10.1
Percent in manufacturing	16.1	13.8	-2.3	19.7	13.6	-6.1
Percent in natural and social sciences	24.2	23.2	-1.0	19.5	26.7	7.2
Percent in clerical occupations	36.9	25.5	-11.4	32.8	27.0	-5.9
Percent in managerial positions	6.1	9.9	3.8	3.5	7.5	4.0

Sources: Statistics Canada, 1981 Survey of Work History and 1998 Labour Force Survey.

21. About one-third of the decline in the unionization rate of younger men and women can be accounted for by changes in the type of occupation or industry in which they were employed.
22. Compositional effects account for even less (about one-quarter) of the increase in the age–wage gap between men aged 17 to 24 and men aged 55 to 64 (See Table 25).

Table 8
Descriptive statistics for full-time workers aged 25 to 34 and aged 45 to 54 — Change in selected characteristics from 1998 to 2011

	Workers aged 25 to 34			Workers aged 45 to 54		
	1998	2011	Change	1998	2011	Change
Men						
Average tenure (months)	51.3	48.0	-3.3	170.1	155.0	-15.1
Percent with a university degree	23.2	27.2	4.0	22.2	23.3	1.1
Percent unionized	25.0	27.0	2.0	45.8	35.6	-10.2
Percent in oil extraction and construction	11.1	18.5	7.4	11.6	14.4	2.8
Percent in wholesale and retail trade	21.3	19.6	-1.7	18.4	21.7	3.3
Percent in health, education, and welfare	6.8	7.5	0.7	13.4	9.9	-3.5
Percent in public administration	5.4	6.0	0.6	11.3	9.0	-2.3
Percent in sales and service occupations	17.5	17.6	0.1	14.0	16.9	2.9
Percent in health occupations	2.1	1.8	-0.3	1.5	1.9	0.4
Percent in occupations in social sciences, education, and government service	4.6	5.4	0.8	8.9	5.5	-3.4
Women						
Average tenure (months)	52.8	48.7	-4.1	146.8	150.4	3.6
Percent with a university degree	28.4	40.4	12.0	19.6	23.8	4.2
Percent unionized	24.3	31.0	6.7	42.3	37.1	-5.2
Percent in oil extraction and construction	2.2	2.9	0.7	2.2	3.3	1.1
Percent in wholesale and retail trade	17.3	15.2	-2.1	12.2	14.9	2.7
Percent in health, education, and welfare	23.3	32.3	9.0	36.1	32.0	-4.1
Percent in public administration	5.8	7.8	2.0	9.2	10.4	1.2
Percent in sales and service occupations	21.6	20.3	-1.3	18.3	19.7	1.4
Percent in health occupations	8.7	13.2	4.5	10.3	11.2	0.9
Percent in occupations in social sciences, education, and government service	11.6	18.1	6.5	15.0	11.3	-3.7

Sources: Statistics Canada, 1981 Survey of Work History and 1998 to 2011 Labour Force Survey.

Compositional effects had a different impact from 1998 to 2011. While young men's unionization rates changed little, the unionization rate of men aged 45 to 54 fell by 10 percentage points (Tables 7 and 8). Young men moved into high-wage industries, such as construction and mining and oil and gas extraction, to a greater extent than did men aged 45 to 54. As well, while men aged 25 to 34 maintained a stable share of employment in health, education, social services, and public administration, men aged 45 to 54 saw their employment share in these sectors drop by almost 6 percentage points. These differential changes in unionization, industry, and occupation explain roughly 60% of the narrowing of the wage gap between younger and older men through this period (Table 9). Differential changes in job tenure also played a minor role. About one-third of the narrowing of the age–wage differential among men remains unexplained.

Table 9
Dynamic Blinder-Oaxaca decompositions of the change in the age log wage gap

	Men aged 25 to 34 versus men aged 45 to 54		Women aged 25 to 34 versus women aged 45 to 54	
	Column 1	Column 2	Column 3	Column 4
	number	percent	number	percent
1981-to-1998 change in the age log wage gap	0.225	100.0	0.169	100.0
Portion explained by				
Education	0.007	3.3	0.009	5.5
Province	-0.011	-4.8	-0.009	-5.1
Union status	0.019	8.4	0.022	13.2
Marital status	0.014	6.2	0.000	0.1
Tenure	0.024	10.6	0.041	24.3
Occupation	0.022	9.8	0.011	6.7
Industry	0.021	9.2	0.059	34.9
Total portion explained	0.096	42.7	0.135	79.6
Portion unexplained	0.129	57.3	0.034	20.4
1998-to-2011 change in the age log wage gap	-0.080	100.0	-0.032	100.0
Portion explained by				
Education	0.001	-0.9	-0.005	14.7
Province	-0.002	2.0	-0.002	6.8
Union status	-0.014	16.9	-0.017	52.0
Marital status	0.002	-2.6	0.001	-1.8
Tenure	-0.004	5.0	0.005	-15.0
Occupation	-0.016	19.8	-0.012	36.2
Industry	-0.018	22.7	-0.003	10.2
Total portion explained	-0.050	62.9	-0.033	103.0
Portion unexplained	-0.030	37.1	0.001	-3.0

Sources: Statistics Canada, authors' calculations based on the 1981 Survey of Work History and the 1998 to 2011 Labour Force Survey.

As with men, differential movements in unionization, industry, and occupation favoured younger women between 1998 and 2011. In addition, younger women increased their educational attainment more than did older women over this period (Table 8). Together, these four factors account entirely for the faster wage growth of younger women since the late 1990s, and thus explain fully the modest narrowing of age–wage differences between younger and older women over the period (Table 9).

Summary

From the early 1980s to the late 1990s, compositional effects exerted upward pressure on the relative wages of workers aged 45 to 54 and downward pressure on the relative wages of workers aged 25 to 34. Conversely, through the 2000s, compositional effects exerted upward pressure on the relative wages of workers aged 25 to 34. From 1981 to 1998, compositional effects accounted for about 40% of the widening of the wage gap between younger and older men, and for about three-quarters of the widening gap between younger and older women. From 1998 to 2011, compositional effects accounted for virtually all of the modest narrowing of the gap between younger and older women and for about two-thirds of the more substantial narrowing of the gap between younger and older men. The end result was that, from 1981 to 2011, average *hourly* wages increased by 17% among men aged 45 to 54, but increased by only 1% among men aged 25 to 34. Hourly wages of women aged 45 to 54 grew by 33%, more than twice the 14% rate observed among younger women.

5 The wage gap between levels of education

Changes in the wage differentials between men and women and younger and older workers occurred while Canadian firms, along with those of many other Western industrialized countries, experienced substantial changes in technology and faced growing competition from abroad.[23] The technological changes that firms implemented and the growing presence of low-wage countries in international trade potentially affected the demand for highly skilled and lower-skilled workers and, thus, the wage growth experienced by these groups. In this context, did wage differences across education levels change?[24]

The first wave of studies examining this question (Freeman and Needels 1993; Murphy et al. 1998; Burbidge et al. 2002) concluded that, for the Canadian labour force as a whole, the wage gap between workers with a university degree and other workers was relatively constant for men and declined for women over the 1980-to-2000 period. According to these studies, the "wage premium" associated with a university education had changed little over this 20-year period.

This view was subsequently challenged by studies that used different data sets and more control variables. Morissette et al. (2006) found that, among private-sector workers, wages of university-educated workers increased relative to those of high school graduates from 1980 to 2000. The increase was observed among both young men and their older counterparts as well as among younger women. No such increase was observed among public-sector workers. Looking at the 1980-to-2005 period, Boudarbat et al. (2010) concluded that, for the labour force as a whole, wages of university-educated workers rose relative to those of their less-educated counterparts, more so among men than among women. Most of the increase in the bachelor's degree/high school wage ratio observed for men occurred between 1980 and 2000.

The LFS allows an investigation of what happened after 2000.[25]

From 2000 to 2011, wages of male university degree holders grew more slowly than those of less-educated males. For instance, average hourly wages of men with trades certificates grew by 7.2%.[26] In contrast, the average hourly wages of males with bachelor's degrees increased by only 2.7% (Table 10).[27] As a result, the wage gap between males with bachelor's degrees and males with trades certificates narrowed during the 2000s. The wage gap between male bachelor's degree holders and male high school graduates also narrowed, but to a lesser extent.

---

23. The introduction of the personal computer and the advent of computer-based technologies were one example of technological change.
24. Of the five dimensions of the wage structure discussed in this study, wage differences between highly-educated workers and their less-educated counterparts likely receive the most attention in both the popular and academic press, perhaps along with the gender wage gap. This is because knowledge of the evolution of this particular wage gap imparts very useful information to a variety of users. The gap in wages between the less-educated and the highly-educated is often described as the economic returns to higher levels of education (e.g., a university degree), since it represents the additional wages that university- (or other) educated individuals earn beyond those of high school graduates. This wage gap is also often referred to as the "university wage premium." Education policy analysts use information on the university or college wage premium to assess the benefits of investments in postsecondary education. Prospective students and their families use such information to determine the economic advantage of attending a postsecondary institution. Academics have used this statistic to better understand the causes of the rising earnings inequality between the less-educated and the highly-educated observed in many Western nations, including Canada. Immigration policy analysts use the information on the change in the wage gap as an indicator of the rising (or falling) demand for highly-educated workers, and may adjust immigration policy accordingly.
25. Because the data sets used in this study contain educational categories that changed during the early 1990s, they do not allow for an analysis of the evolution of wage differences across education levels from 1981 to 2000.
26. All numbers in this section are based on the March and September files of the LFS.
27. Average weekly wages grew by about 8% among men with trades certificates and by about 2% among males with bachelor's degrees.

Table 10
Average real hourly wages (2010 dollars) by education level, full-time workers aged 17 to 64, 1997 to 2011

	Less than high school	High school	Postsecondary education	Trades certificate	Bachelor's degree	Postgraduate studies
	Column 1	Column 2	Column 3	Column 4	Column 5	Column 6
			dollars			
Men						
Year						
1997	18.52	20.36	23.07	23.12	29.08	34.24
1998	18.54	20.42	23.39	23.06	28.63	33.90
1999	18.26	20.50	23.72	22.81	29.54	34.96
2000	18.44	20.83	23.60	23.10	29.63	34.15
2001	18.44	20.67	23.78	23.32	29.95	33.51
2002	17.99	20.62	23.91	23.52	30.35	34.40
2003	18.10	20.44	23.60	23.28	29.45	34.20
2004	18.19	20.25	23.64	23.01	29.75	34.25
2005	18.17	20.88	23.58	23.12	29.65	33.92
2006	18.45	20.72	23.93	23.47	30.06	33.88
2007	18.74	20.98	23.99	23.79	29.98	34.29
2008	19.03	21.31	24.58	24.58	30.50	35.70
2009	19.73	21.84	25.33	25.03	31.33	34.99
2010	19.60	21.93	25.07	25.49	31.01	35.00
2011	19.24	21.69	24.89	24.77	30.43	34.28
			percent change			
Period						
2000 to 2005	-1.5	0.2	0.0	0.1	0.1	-0.7
2005 to 2011	5.9	3.9	5.6	7.1	2.6	1.1
2000 to 2011	4.3	4.1	5.5	7.2	2.7	0.4
			dollars			
Women						
Year						
1997	13.62	16.78	19.42	16.84	24.51	29.03
1998	13.72	16.74	19.43	16.50	24.56	29.82
1999	13.48	16.73	19.42	16.54	24.93	29.98
2000	13.47	16.68	19.42	17.11	24.96	28.91
2001	13.50	16.66	19.44	16.82	24.80	29.01
2002	13.37	16.95	19.99	16.86	25.51	30.10
2003	13.50	16.68	19.75	16.73	25.62	29.68
2004	13.43	16.87	20.08	17.10	25.57	30.43
2005	13.84	17.27	20.04	17.78	25.52	29.90
2006	13.91	17.15	20.32	17.84	25.81	30.77
2007	13.92	17.21	20.54	17.76	25.96	30.47
2008	14.26	17.49	20.99	18.38	26.38	30.78
2009	14.83	18.18	21.61	18.38	27.18	31.98
2010	15.12	18.33	21.59	18.79	26.92	32.01
2011	14.80	18.09	21.61	18.63	27.01	31.40
			percent change			
Period						
2000 to 2005	2.7	3.5	3.2	4.0	2.2	3.4
2005 to 2011	6.9	4.8	7.8	4.8	5.8	5.0
2000 to 2011	9.8	8.4	11.3	8.9	8.2	8.6

Sources: Statistics Canada, Labour Force Survey and Consumer Price Index (All-items).

The narrowing of the wage gap was particularly evident among the young, as wage growth was very strong among less-educated younger workers. From 2000 to 2011, hourly wages grew by 16% among full-time male workers aged 17 to 34 with trades certificates and by about 8% among their counterparts with high school diplomas. Among bachelor's degree holders, growth was roughly 1% (Table 11). Differences in wage growth across education levels were less pronounced among workers aged 35 to 64 (Table 12).

Table 11
Average real hourly wages (2010 dollars) by education level, full-time workers aged 17 to 34, 1997 to 2011

	Less than high school	High school	Postsecondary education	Trades certificate	Bachelor's degree	Postgraduate studies
	Column 1	Column 2	Column 3	Column 4	Column 5	Column 6
			dollars			
Men						
Year						
1997	14.93	16.45	19.01	19.55	23.61	27.18
1998	14.77	16.76	19.04	19.41	24.31	27.60
1999	14.48	16.55	19.37	19.06	24.89	28.59
2000	14.76	16.88	19.22	19.48	25.46	28.12
2001	14.70	16.93	19.72	19.65	25.83	30.06
2002	14.92	16.83	19.50	19.79	25.75	29.41
2003	14.75	16.51	19.16	19.43	24.63	27.48
2004	14.67	16.25	19.38	19.40	24.71	26.65
2005	14.95	17.12	19.39	20.16	25.03	28.57
2006	15.36	17.24	19.79	20.62	25.02	27.59
2007	15.57	17.38	19.93	21.12	25.11	28.20
2008	15.69	17.81	20.49	21.97	25.82	28.98
2009	16.70	18.37	21.06	22.29	25.81	28.59
2010	16.63	18.34	20.92	23.18	26.12	28.28
2011	16.11	18.21	20.55	22.60	25.73	27.71
			percent change			
Period						
2000 to 2005	1.3	1.4	0.9	3.5	-1.7	1.6
2005 to 2011	7.7	6.4	6.0	12.1	2.8	-3.0
2000 to 2011	9.2	7.9	7.0	16.0	1.1	-1.5
			dollars			
Women						
Year						
1997	12.00	14.24	16.63	15.12	21.24	24.09
1998	11.99	13.71	16.87	14.80	21.41	25.02
1999	12.09	13.85	16.70	14.57	21.91	25.96
2000	11.46	13.96	16.65	14.77	21.84	25.21
2001	11.69	13.67	16.87	14.85	21.90	25.96
2002	11.46	13.59	17.18	15.20	23.09	26.27
2003	11.46	13.42	16.96	14.64	22.44	25.67
2004	11.45	13.57	17.03	15.03	22.76	25.62
2005	11.72	14.09	17.12	15.38	22.43	25.29
2006	12.22	14.13	17.30	15.34	22.63	26.78
2007	12.05	14.41	17.62	16.17	23.03	26.50
2008	12.15	14.59	17.93	16.45	23.63	25.85
2009	13.42	15.19	18.36	16.44	23.75	27.86
2010	13.45	15.23	18.63	17.10	23.32	26.37
2011	13.16	15.57	18.60	17.27	23.62	26.21
			percent change			
Period						
2000 to 2005	2.3	0.9	2.9	4.1	2.7	0.3
2005 to 2011	12.3	10.5	8.6	12.3	5.3	3.6
2000 to 2011	14.9	11.6	11.7	16.9	8.2	4.0

Sources: Statistics Canada, Labour Force Survey and Consumer Price Index (All-items).

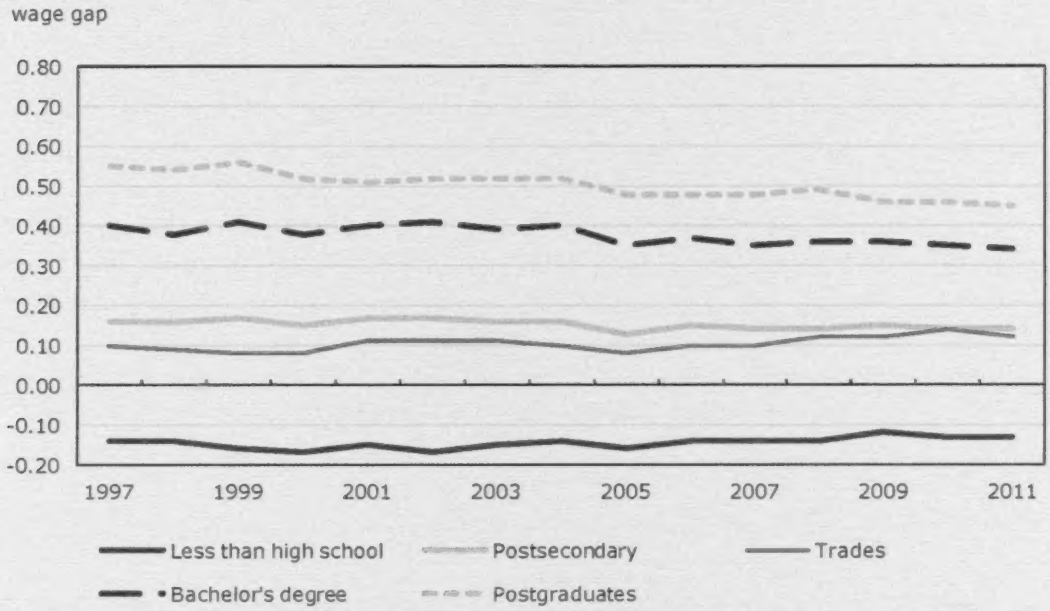
Table 12
Average real hourly wages (2010 dollars) by education level, full-time workers aged 35 to 64, 1997 to 2011

	Less than high school	High school	Postsecondary education	Trades certificate	Bachelor's degree	Postgraduate studies
	Column 1	Column 2	Column 3	Column 4	Column 5	Column 6
	dollars					
Men						
Year						
1997	20.23	23.47	26.65	24.92	32.73	36.60
1998	20.29	23.29	26.73	24.82	31.83	36.03
1999	20.08	23.58	27.05	24.60	32.65	37.04
2000	20.18	23.71	26.91	24.85	32.42	36.11
2001	20.15	23.30	26.90	25.11	32.45	34.68
2002	19.46	23.08	27.09	25.18	33.12	35.93
2003	19.69	23.10	26.66	24.95	32.42	36.48
2004	19.74	22.96	26.60	24.59	32.64	36.49
2005	19.69	23.40	26.40	24.48	32.14	35.37
2006	19.97	23.07	26.66	24.79	32.72	35.66
2007	20.23	23.47	26.70	25.09	32.60	36.10
2008	20.58	23.72	27.23	25.79	33.07	37.67
2009	21.22	24.16	28.08	26.32	34.32	36.96
2010	20.99	24.22	27.64	26.71	33.54	37.02
2011	20.72	24.00	27.49	25.88	32.92	36.30
	percent change					
Period						
2000 to 2005	-2.5	-1.3	-1.9	-1.5	-0.8	-2.1
2005 to 2011	5.3	2.5	4.1	5.7	2.4	2.6
2000 to 2011	2.7	1.2	2.2	4.1	1.6	0.5
	dollars					
Women						
Year						
1997	14.15	18.17	21.57	18.06	27.57	31.49
1998	14.32	18.24	21.33	17.53	27.42	32.25
1999	13.93	18.20	21.37	17.72	27.48	31.88
2000	14.15	18.00	21.31	18.23	27.70	30.97
2001	14.11	18.02	21.18	17.90	27.21	30.55
2002	13.99	18.46	21.79	17.75	27.47	32.21
2003	14.13	18.07	21.49	17.85	28.15	31.66
2004	14.07	18.27	21.99	18.04	27.77	32.70
2005	14.51	18.70	21.73	18.91	27.80	32.19
2006	14.44	18.50	22.08	18.89	28.29	32.64
2007	14.62	18.42	22.21	18.46	28.03	32.32
2008	15.03	18.77	22.72	19.30	28.31	33.27
2009	15.26	19.40	23.35	19.33	29.62	34.01
2010	15.69	19.61	23.19	19.65	29.43	34.39
2011	15.39	19.15	23.18	19.22	29.30	33.78
	percent change					
Period						
2000 to 2005	2.6	3.9	1.9	3.7	0.4	3.9
2005 to 2011	6.0	2.4	6.7	1.7	5.4	4.9
2000 to 2011	8.7	6.4	8.8	5.5	5.8	9.1

Sources: Statistics Canada, Labour Force Survey and Consumer Price Index (All-items).

This recent narrowing of male wage differences across education levels is also observed in multivariate analyses that control for workers' potential experience (charts 8 and 9) and in analyses that use weekly wages, instead of hourly wages, as a measure of pay rates.[28] A narrowing of pay differences is also found in such analyses among women (charts 10 and 11). Nevertheless, highly-educated workers today still earn much more than their less-educated counterparts. Controlling for potential work experience, average hourly wages of male bachelor's degree holders were 41% higher than those of male high school graduates in 2011, down from 47% in 2000.[29] The corresponding result for women in 2011 was 55%, down from 61% in 2000.[30]

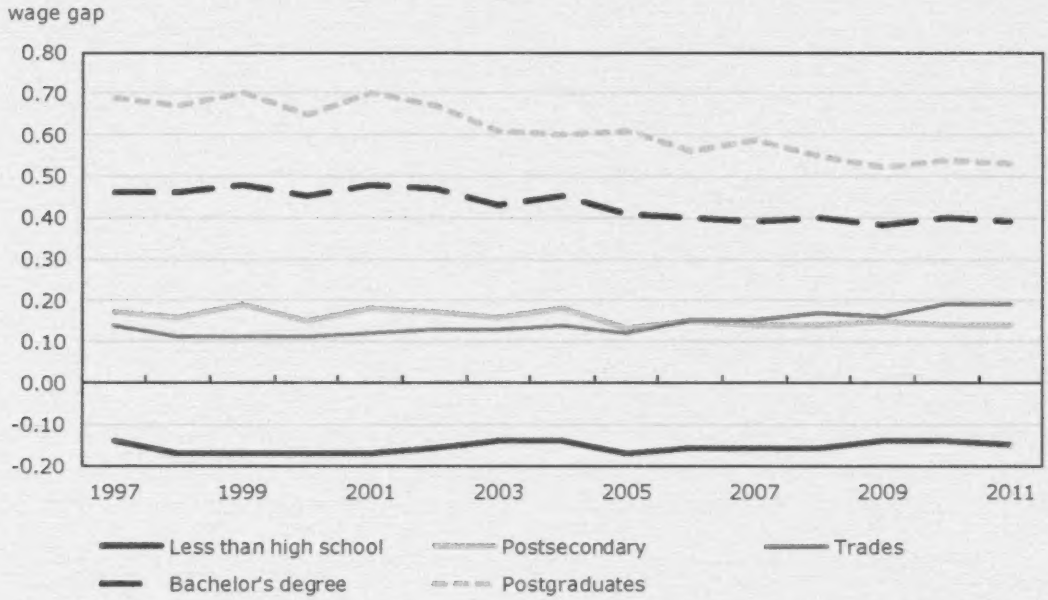
Chart 8
Regression-adjusted wage gap in log hourly wages relative to high school graduates — Full-time male workers aged 17 to 64



Source: Statistics Canada, authors' calculation based on the Labour Force Survey.

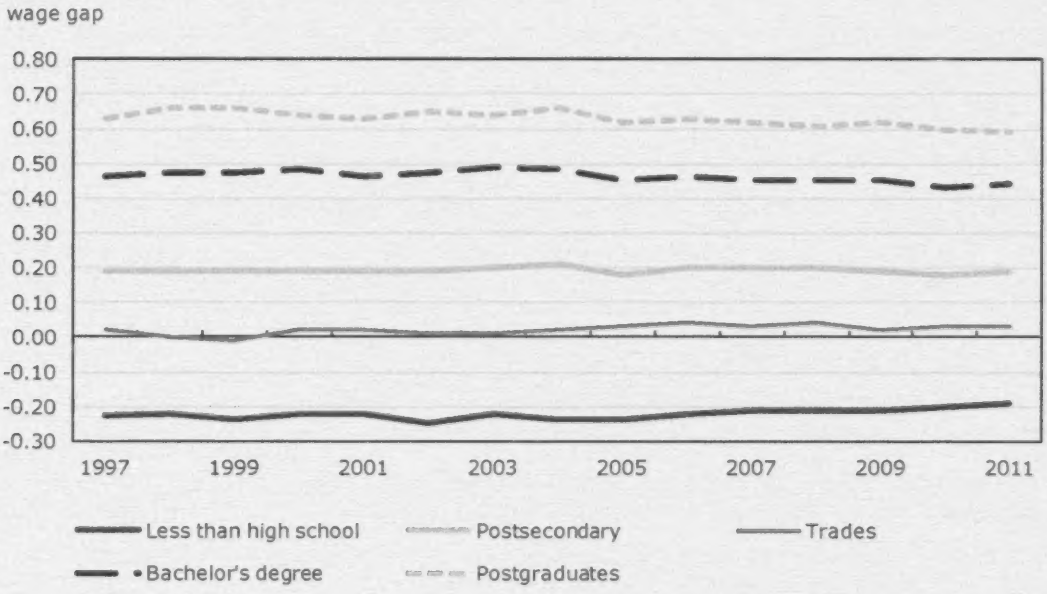
28. In line with Boudarbat et al. (2010), a quartic in potential work experience is used in year-specific regression analyses. Potential work experience is defined as a person's age minus the number of years of completed schooling, minus 6. In these regression analyses, the dependent variable is either the natural logarithm of hourly wages or the natural logarithm of weekly wages. The omitted educational category consists of high school graduates. As Charts 8 and 9 show, a good portion of the narrowing of wage differences for men took place from the late 1990s/early 2000s to the mid-2000s. Since LFS data allow a distinction between immigrant and Canadian-born workers starting only in 2006, whether the narrowing that occurred from the late 1990s/early 2000s to the mid-2000s is observed for both groups of workers cannot be investigated.
29. These numbers result from year-specific regression analyses performed on full-time male workers aged 17 to 64. They are obtained by taking the antilog of the bachelor's degree coefficient, minus 1.
30. When weekly wages are used as a measure of pay rates, average weekly wages of male bachelor's degree holders were, all else equal, 37% higher than those of male high school graduates in 2011, down from 43% in 2000. The corresponding result for women in 2011 was 55%, down from 62% in 2000.

Chart 9
Regression-adjusted wage gap in log hourly wages relative to high school graduates — Full-time male workers aged 17 to 34



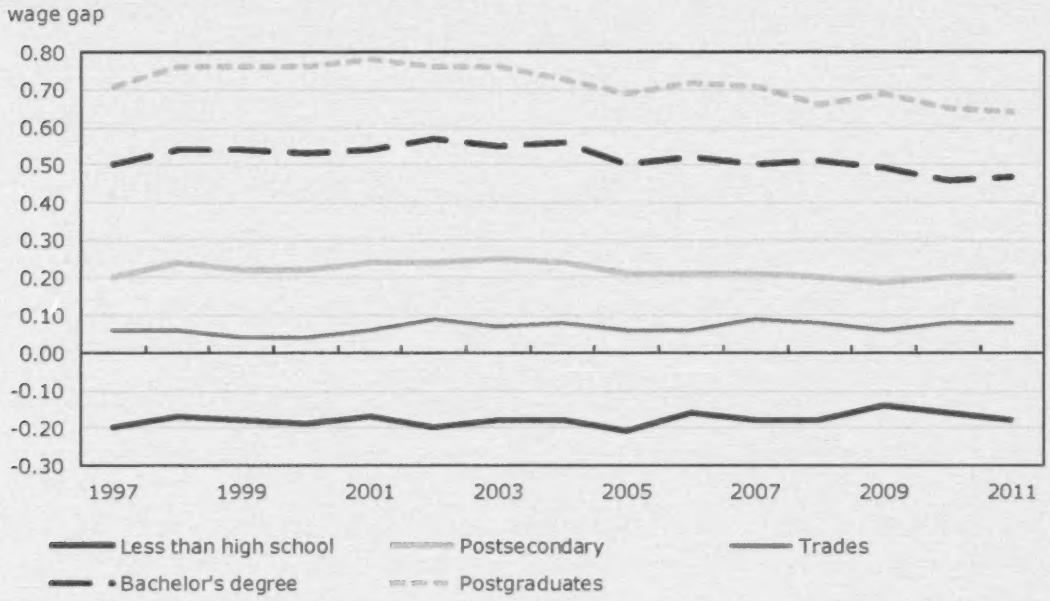
Source: Statistics Canada, authors' calculation based on the Labour Force Survey.

Chart 10
Regression-adjusted wage gap in log hourly wages relative to high school graduates — Full-time female workers aged 17 to 64



Source: Statistics Canada, authors' calculation based on the Labour Force Survey.

Chart 11
Regression-adjusted wage gap in log hourly wages relative to high school graduates — Full-time female workers aged 17 to 34



Source: Statistics Canada, authors' calculation based on the Labour Force Survey.

The increase in the university wage premium over the 1980-to-2000 period is often viewed as resulting from a more rapid increase in the demand, relative to supply, for the university-educated than for the high-school-educated. Technological changes that are biased towards skilled workers are assumed to have increased the relative demand for highly-educated workers (Katz and Murphy 1992). This interpretation has often been applied to the United States, which experienced faster growth in the university wage premium than Canada. It also fits with other changes taking place in the Canadian labour market.

For instance, employment in high-knowledge industries grew by 84% between 1981 and 2001, compared with 52% and 32%, in the medium- and low-knowledge industries, respectively (Morissette et al. 2006). Furthermore, high-knowledge industries not only experienced rapid employment growth, but the educational attainment of their workforces also rose more quickly than that of workforces in other industries. One would expect these factors to increase the labour demand for university graduates much more than that for high school graduates. However, according to Murphy et al. (1998), the supply of university graduates grew rapidly, more rapidly than the supply of high school graduates. The fact that the supply of university graduates—relative to high school graduates—grew faster in Canada than in the United States was viewed by these authors as the main reason why the university wage premium grew, if at all, less in Canada than in the United States.

The results above strongly suggest that the 2000s were different, as wage differences across education levels narrowed. This new pattern emerged in a period of three important economic shocks: a severe employment contraction in the computer and telecommunications industries between 2001 and 2004 with slow recovery thereafter; strong growth in the construction sector; and an increase in the world prices of oil and other commodities.[31] While the first shock may have reduced upward pressures on labour demand for certain university graduates, the next two

31. From 2001 to 2004, employment in the computer and telecommunications sector fell by about 15%.

supported employment growth in construction and in the mining and oil and gas extraction industries, thereby potentially increasing the demand for other workers despite the continued trend decline in manufacturing employment over the 2000-to-2011 period. Additional research is needed to confirm these hypotheses.

Overall, LFS data indicate that, between 2000 and 2011, education-related wage differences narrowed for men and women. This narrowing was most pronounced among workers under age 35. Combining these results with those of Morissette et al. (2006) and Boudarbat et al. (2010) suggests that, after increasing from 1980 to 2000, the wage gap between the less-educated and the highly-educated decreased during the 2000s, particularly among individuals under age 35, largely as a result of faster wage growth among less-educated workers. Nevertheless, highly-educated workers today still earn much more than their less-educated counterparts.

6 Changes in inter-industry wage differentials

Some Canadian workers may have experienced relatively stronger wage growth over the last three decades not only because they increased their education, labour market experience, and job tenure to a greater extent than others, but also because they moved to high-paying sectors, i.e., industries that pay observationally equivalent workers higher wages.

The existence of inter-industry wage differentials has been well documented (Gera and Grenier, 1994; Krueger and Summers 1988; Dickens and Katz 1987; Murphy and Topel 1987). Yet the factors underlying these wage differences are less well-known. The most obvious explanation emphasizes that different industries pay different wages simply because they employ individuals who hold different occupations and who differ in terms of experience, observed skill levels, and degree of unionization. However, sizable inter-industry wage differences remain even after accounting for these factors. Unobserved differences in worker ability could also play a role, but various studies (e.g., Murphy and Topel 1987) suggest that accounting for such differences does not eliminate inter-industry wage differentials.

The fact that sizable inter-industry wage differentials remain even after taking account of workers' observed and unobserved characteristics suggests that inter-industry differences among *employers* matter. One explanation assumes that industries whose firms face high training costs or high costs of monitoring worker effort will pay higher-than-average wages, denoted "efficiency wages," in order to reduce worker turnover or increase productivity.[32] Alternatively, industries that have relatively high profits per worker may share some of these profits with their workers by offering them higher-than-average wages.[33,34]

32. It is assumed that, for these industries, the reduction in training costs and/or the increase in productivity induced by higher-than-average wages more than offset the increase in labour costs associated with the payment of these wages, thereby leading to higher profits.
33. For Canada, Gera and Grenier (1994) concluded that inter-industry wage differentials are relatively stable over time, and are consistent with the notion that firms in some industries have higher profits per worker and share these gains with workers. For the United States, Alexopoulos (2001) also concluded that some form of efficiency wages play a major role in the differences in wages among industries.
34. Other factors may be important: firms' exposure to import competition or degree of export orientation; the magnitude of foreign investment; the degree of value-added achieved in the commodities or services produced by the industry; and capital intensity. Grey (1993) examined the importance of these factors for Canada, focusing on the manufacturing sector. He found that the degree of value-added explained more of the inter-industry variation than other variables. As expected, import orientation was negatively correlated with industry-level wages while export orientation was positively, but weakly, associated with industry-level wages.

While the relative contribution of the aforementioned factors is still an open question, most studies find that inter-industry wage differentials are relatively stable over time. However, inter-industry wage differentials do change somewhat over time, as different industries are exposed to, and respond to, different changes in their economic environment.[35]

How did wage growth vary across industries over the last three decades? Did pay rates in the goods sector grow in tandem with those in the services sector? Was wage growth uniform across all services industries? What happened to wages in textile, leather, and clothing during the 1980s and 1990s, as this sector faced growing international competition? How did wages evolve in mining and oil and gas extraction over the last decade, as world prices of oil and minerals increased? This section answers these questions.

The definitions of industrial sectors available in the data sets used in this study changed significantly during the three decades considered, moving from being based on SIC 1980 during the 1981-to-1998 period to being based on NAICS 2007 during the 1998-to-2011 period. Except for a few sectors, these two industrial classifications are generally not comparable.[36] Rather than attempt to reconcile the differences between these classifications and establish one single coding system—which requires aggregating several industries and the potential loss of inter-industry wage variation—the analysis is conducted separately for the two sub-periods.

1981 to 1998

From 1981 to 1998, average wages grew by 3.4% at the aggregate level (Table 13). Most of the broad industrial groupings considered in Table 13 for which wages increased registered an average wage growth that varied between 1% and 6%. The one exception was business services, which displayed an average wage growth of 13.5%; within this industrial grouping, the financial sector experienced wage growth of 20.1%.[37] In contrast, construction and retail trade saw average wages decline by roughly 6% and 2%, respectively. As a result, substantial cross-industry differences in wage growth were observed.

35. For instance, a reduction in interest rates may help support demand for construction while an increase in the value of the Canadian dollar on the foreign-exchange market may reduce the global demand for exports of manufactured goods.
36. There are a few exceptions. For instance, industry codes for some services-producing industries, such as finance and retail trade, are fairly consistent.
37. Business services include finance industries, insurance carriers, insurance agencies, real estate industries, and services to business management.

Table 13

Real hourly wages (2010 dollars) in selected industrial groups, full-time jobs, 1981 to 1998

Industrial group	Median hourly wages			Average hourly wages		
	1981	1998	Change	1981	1998	Change
	Column 1	Column 2	Column 3	Column 4	Column 5	Column 6
	dollars		percent	dollars		percent
All industries	18.83	19.46	3.3	20.62	21.32	3.4
Forestry and mining	23.54	24.54	4.3	24.57	25.45	3.6
Construction	22.08	20.42	-7.5	23.00	21.54	-6.3
Manufacturing	18.95	19.74	4.2	20.41	21.38	4.8
Distributive services	20.26	21.27	5.0	21.61	22.32	3.3
Business services	17.02	20.29	19.2	20.12	22.83	13.5
Finance	17.09	20.56	20.3	19.85	23.83	20.1
Other business services	16.92	20.05	18.5	20.26	22.48	11.0
Consumer services	13.53	12.76	-5.7	15.57	15.31	-1.7
Retail trade	14.71	14.04	-4.6	16.57	16.22	-2.1
Other consumer services	11.77	12.28	4.3	14.20	14.40	1.4
Public services	21.18	22.97	8.5	23.29	24.66	5.9

Sources: Statistics Canada, 1981 Survey of Work History, 1998 Labour Force Survey, and Consumer Price Index (All-items).

These substantial movements in industry-level wages occurred while the Canadian workforce became more educated and while the mix of occupations within industries was transformed as a result of technological changes, among other factors. However, these changes in occupations and in workers' education were not uniform across industries. For instance, the percentage of clerical workers dropped by 14 percentage points (from 54.2% to 40.1%) between 1981 and 1998 in finance but fell by only about 4 percentage points (from 21.8% to 18.0%) in retail trade during this period. Conversely, the percentage of workers with a university degree increased by 13 percentage points (from 13.7% to 26.7%) in finance but by only 4.5 points (from 3.8% to 8.3%) in retail trade. As a result, the profile of workers changed much faster in finance than it did in retail trade. This likely affected inter-industry wage differentials.

Table 14 confirms this hypothesis. A comparison of numbers reported in columns 1 and 3 for retail trade and finance indicates that almost half of the *difference* in wage growth initially observed between these two sectors—i.e., the "extra" wage growth experienced by workers in finance relative to their counterparts in retail trade—can be accounted for by differential changes in workers' age, education, job tenure, and occupation.[38] The same conclusion applies when comparing finance and construction. In many cases, differential changes in workforce characteristics and occupations accounted for a significant portion of the inter-industry differences in wage growth observed over the 1981-to-1998 period.[39]

38. In this regard, the following should be noted: a) in the absence of controls, average log wages grew 0.199 points faster in finance than in retail trade; and b) after controlling for changes in occupation and worker characteristics, average log wages grew 0.108 points faster in finance than in retail trade.

39. Average log wages in finance grew 0.228 points faster than those in construction (Column 1). After controlling for changes in worker and job characteristics, this difference is reduced by about one-half, to 0.119 points (Column 3). Likewise, while average log wages in finance grew 0.140 points faster than those in manufacturing (Column 1), this difference drops to 0.064 points after accounting for changes in worker attributes and occupations (Column 3). Hence, movements towards highly paid occupations and the relatively fast upgrading of the skills of workers employed in the finance industry explain, to a large extent, the relatively strong wage growth observed in this sector between 1981 and 1998.

Table 14

Changes in average log wages in selected industrial groups, full-time jobs, 1981 to 1998

Industrial group	No controls	Controls for gender, age, education, and seniority	Column 2 plus controls for two-digit occupations	Sample size
	Column 1	Column 2	Column 3	Column 4
		number		
Forestry and mining	0.030	0.002	-0.025	2,573
Construction	-0.045 *	-0.064 ***	-0.062 ***	3,758
Manufacturing	0.043 ***	-0.004	-0.007	14,160
Distributive services	0.036 **	0.001	-0.005	9,825
Business services	0.148 ***	0.075 ***	0.056 ***	6,571
Finance	0.183 ***	0.088 ***	0.057 ***	1,986
Other business services	0.139 ***	0.078 ***	0.054 **	4,585
Consumer services	0.004	-0.040 ***	-0.041 ***	12,479
Retail trade	-0.016	-0.051 ***	-0.051 ***	6,794
Other consumer services	0.052 **	-0.012	-0.034 *	5,685
Public services	0.085 ***	0.004	-0.006	18,254

Note: †p<0.10; *p<0.05; **p<0.01; ***p<0.001 (two-tailed test).
Sources: Statistics Canada, authors' calculations based on the 1981 Survey of Work History and the 1998 Labour Force Survey.

Compositional effects did not matter everywhere, however, as they fail to explain why wages in some manufacturing industries grew faster than wages in other industries. For instance, average (log) wages in paper and allied industries and in electrical products grew much faster than those in the leather, textile, and clothing industries, a sector that experienced a decline in real wages (Table 15, Column 1). Most of the *differences* in wage growth initially observed between these industries remain after controlling for changes in worker characteristics and occupations (Column 3), thereby indicating that changes in worker characteristics and occupations were not important factors. Other factors, which affected these industries differently, appear to have played a major role. Of these, changing international competition is a potential candidate. However, assessing its impact is beyond the scope of this study.

Table 15
Changes in average log wages in selected manufacturing industries, full-time jobs, 1981 versus 1997 to 1998

Industry	No controls	Controls for gender, age, education, and seniority	Column 2 plus controls for two-digit occupations	Sample size
	Column 1	Column 2	Column 3	Column 4
		number		
Food and beverage	0.031	-0.039 †	-0.028	3,388
Leather, textile, and clothing	-0.067 **	-0.127 ***	-0.137 ***	1,591
Wood, furniture, and fixtures	-0.034	-0.081 ***	-0.085 ***	2,472
Paper and allied industries	0.142 ***	0.086 **	0.087 ***	1,708
Primary metal and metal fabricating industries	0.005	-0.025	-0.007	2,875
Transportation equipment	0.057 **	0.038 *	0.036 †	2,772
Electrical products	0.130 ***	0.064 *	0.040	1,221
Petroleum, coal products, chemical, and chemical products industries	0.050	0.005	0.012	1,133

Note: †p<0.10; *p<0.05; **p<0.01; ***p<0.001 (two-tailed test).
Sources: Statistics Canada, authors' calculations based on the 1981 Survey of Work History and the 1997 to 1998 Labour Force Survey.

1998 to 2011

While most industrial sectors registered fairly modest wage growth during the 1980s and 1990s, the late 1990s and 2000s were different, as average wages increased by 10.3% from 1998 to 2011 (Table 16). Coincident with the commodity boom observed over much of this period, average wages in the resources sector (mining and oil and gas extraction) grew the fastest, at 21.0%. Wholesale trade, finance, and professional and technical services also posted above-average wage growth. Likely fueled by strong demand for housing, hourly wages in construction rose by 9.8%, more than offsetting the wage declines experienced from 1981 to 1998. In contrast, manufacturing and retail trade experienced growth in average wages of 5.0% and 3.0%, respectively.

Table 16
Real hourly wages (2010 dollars) in selected industrial groups, full-time jobs, 1998 to 2011

Industrial group	Median hourly wages			Average hourly wages		
	1998	2011	Change	1998	2011	Change
	Column 1	Column 2	Column 3	Column 4	Column 5	Column 6
	dollars		percent	dollars		percent
All industries	19.57	20.82	6.4	21.37	23.58	10.3
Mining, quarrying, and oil and gas extraction	26.39	30.02	13.8	27.01	32.67	21.0
Construction	20.88	22.90	9.7	22.00	24.16	9.8
Manufacturing	19.78	19.85	0.4	21.36	22.43	5.0
Wholesale trade	17.86	19.95	11.7	20.12	23.05	14.6
Retail trade	14.21	14.52	2.2	16.47	16.96	3.0
Transportation and warehousing	21.05	21.72	3.2	21.28	23.02	8.1
Information and cultural industries	24.54	25.18	2.6	25.50	27.35	7.2
Finance	20.56	23.28	13.2	23.80	26.72	12.3
Professional, scientific, and technical services	22.25	25.18	13.1	24.63	28.52	15.8
Administrative and support, waste management, and remediation services	13.84	14.52	4.9	16.12	17.07	5.9
Accommodation and food services	11.17	12.22	9.4	12.83	14.07	9.7
Public services	22.97	24.83	8.1	24.83	27.14	9.3

Source: Statistics Canada, 1998 to 2011 Labour Force Survey and Consumer Price Index (All-items).

As was the case from 1981 to 1998, increases in worker skills and employment movements towards highly paid occupations accounted for a significant portion of the wage growth observed in finance between 1998 and 2011. This can be seen by comparing columns 1 and 3 of Table 17. A similar qualitative conclusion applies to wholesale trade as well as to professional, scientific, and technical services. In contrast, compositional effects explained very little of the wage growth observed in the mining and oil and gas extraction industries. Wage growth in this sector was likely related primarily to rising labour demand associated with the commodity boom. Likewise, most of the wage growth in construction remained after accounting for compositional effects. This suggests that wage growth in construction was driven mainly by the shifts in housing demand observed during the 2000s.

Table 17
Changes in average log wages in selected industrial groups, full-time jobs, 1998 to 2011

Industrial group	No controls	Controls for gender, age, education, and seniority	Column 2 plus controls for two-digit occupations	Sample size
	Column 1	Column 2	Column 3	Column 4
		number		
Mining, quarrying, and oil and gas extraction	0.179 ***	0.179 ***	0.169 ***	2,217
Construction	0.094 ***	0.097 ***	0.087 ***	5,300
Manufacturing	0.050 ***	0.014	0.019 *	13,246
Wholesale trade	0.131 ***	0.082 ***	0.077 ***	3,024
Retail trade	0.029 *	0.033 **	0.070 ***	8,517
Transportation and warehousing	0.071 ***	0.078 ***	0.080 ***	4,239
Information and cultural industries	0.056 *	0.041 †	0.037 †	1,955
Finance	0.098 ***	0.051 *	0.043 *	2,221
Professional, scientific, and technical services	0.143 ***	0.070 ***	0.075 ***	3,660
Administrative and support, waste management, and remediation services	0.074 ***	0.053 **	0.068 ***	2,472
Accommodation and food services	0.099 ***	0.089 ***	0.094 ***	3,905
Public services	0.077 ***	0.088 ***	0.083 ***	23,092

Note: †p<0.10; *p<0.05; **p<0.01; ***p<0.001 (two-tailed test).
Source: Statistics Canada, authors' calculations based on the 1998 to 2011 Labour Force Survey.

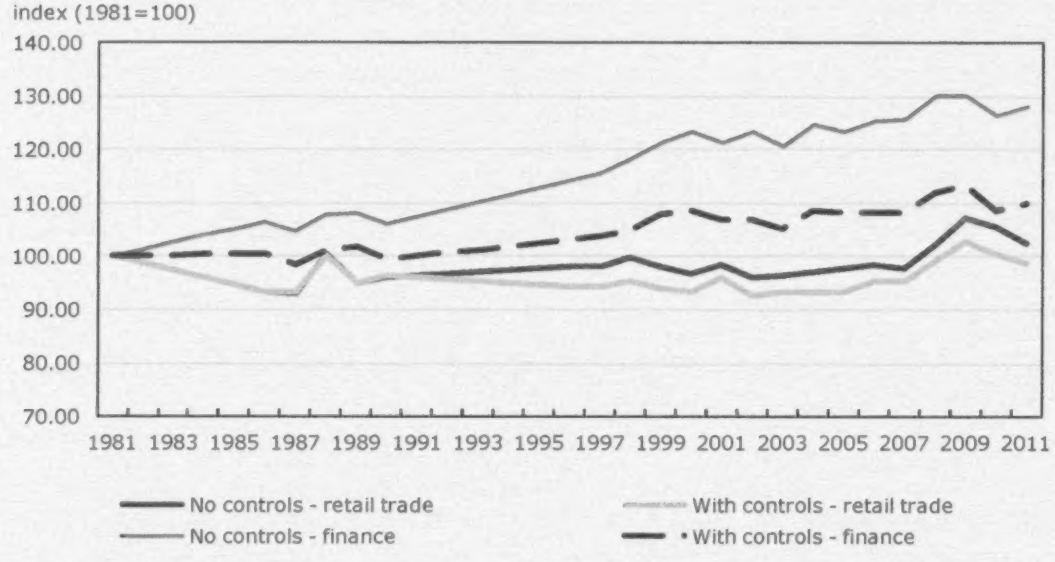
From 1998 to 2011, average log wages in mining, quarrying, and oil and gas extraction grew 0.15 points faster than those in retail trade. Two-thirds of this difference remains after controlling for compositional effects, implying that differential changes in worker characteristics and occupations accounted for only one-third of this difference.

Combining data from both periods, one notable development is that average wages in finance grew by 20% from 1981 to 1998 and by 12% from 1998 to 2011, whereas average wages in retail trade fell by 2% from 1981 to 1998 and rose by 3% from 1998 to 2011 (Chart 12). As Chart 13 indicates, however, much of this difference in wage growth resulted from the relatively rapid upskilling of the workforce in the financial sector, a pattern that has also been observed in the United States (Philippon and Reshef 2007).

Chart 12
Index of real wages in finance and retail trade, 1981 to 2011 — Median wages and average wages (1981=100)

Sources: Statistics Canada, 1981 Survey of Work History, 1984 Survey of Union Membership, 1986 to 1990 Labour Market Activity Survey, 1997 to 2011 Labour Force Survey, and Consumer Price Index (All-items).

Chart 13
Index of average real log wages in finance and retail trade, 1981 to 2011 — With controls and without controls (1981=100)



Sources: Statistics Canada, 1981 Survey of Work History, 1984 Survey of Union Membership, 1986 to 1990 Labour Market Activity Survey, 1997 to 2011 Labour Force Survey, and Consumer Price Index (All-items).

Overall, pay rates grew little in most industrial sectors from 1981 to 1998. The obvious exception was the financial services sector, which experienced strong wage growth, due largely to a fast-growing share of university graduates and changes in the types of occupations used. Among workers with comparable characteristics and occupations, wages fell substantially in the leather, textile, and clothing industries. From 1998 to 2011, several industrial sectors experienced close to two-digit wage growth. Yet there was considerable inter-industry variation in wage growth. The mining and petroleum sector experienced the fastest wage growth. Compositional effects had little to do with this fast wage growth, which coincided with increases in world oil prices and world commodity prices.[40] In contrast, retail trade posted fairly modest wage growth. Average real hourly wages in construction grew by roughly 10% from 1998 to 2011, after falling by about 6% from 1981 to 1998.

7 Changes in the occupational wage structure

Since the early 1980s, wages of Canadian workers may have grown at a different pace, not only across industries but also across occupations. The reason is that the human capital requirements of some jobs, the relative scarcity of individuals able to fill specific positions, the ability of workers to extract "rents" in some occupations, and social norms, all of which are potentially important determinants of pay rates, may have changed over the last three decades.

Because their wages have grown rapidly in recent years in North America, senior executives belong to an occupation that has received considerable attention over this period. While the growth in their wages has been well documented (e.g., Piketty and Saez 2006), the factors that underlie it are not well understood. Potential explanations cited in the literature include changes in pay-setting methods and social norms, the increasing ability of executives to set their own wages (and, thus, to extract rents from shareholders), and the rise in wages associated with an increase in the size and market capitalization of firms. Whatever the cause, the growing gap between senior executives and other workers has contributed to the growth of wage inequality in North America (Lemieux 2008).

The occupational categories available in the data sets used in this study do not allow an explicit identification of senior executives. However, "managers" can be identified. As was the case in the industry analysis, the special surveys used prior to 1998 followed a different occupational coding system than that followed by the LFS post 1998. Hence, a time series with comparable definitions of occupations cannot be produced for the entire 1981-to-2011 period. However, comparable occupational data can be produced for the two sub-periods, 1981-to-1998 and 1998-to-2011.

1981 to 1998

At the high level of aggregation used in Table 18, there was relatively little change in the occupational wage structure from 1981 to 1998. Some occupations displayed negative growth in median or average wages (e.g., professionals and managers, service occupations, and blue-collar occupations), while others displayed positive growth (e.g., occupations in natural and social sciences, clerical and sales occupations). However, in both cases, the change in average wages was relatively small, ranging from -5.3% to +7.3%. In particular, professionals and managers did not experience rapid wage growth. As columns 1 and 3 of Table 19 indicate, controlling for differences among occupations in gender, age, education, job tenure, and industry leads to a reduction in the inter-occupational variation in wage growth, but the basic result remains: relatively little difference in wage growth across occupations took place over the 17-year period.

40. Wage growth in this sector may also reflect the challenge of attracting workers to jobs located in small and remote communities.

Table 18
Real hourly wages (2010 dollars) by occupational group, full-time workers, 1981 to 1998

Occupational group	Median hourly wages			Average hourly wages		
	1981	1998	Change	1981	1998	Change
	Column 1	Column 2	Column 3	Column 4	Column 5	Column 6
	dollars		percent	dollars		percent
All occupations	18.83	19.46	3.3	20.62	21.32	3.4
Professionals and managers	25.72	24.54	-4.6	27.09	26.60	-1.8
Natural and social sciences	24.38	26.16	7.3	25.77	26.96	4.6
Clerical occupations	16.24	16.97	4.5	17.20	17.47	1.6
Sales	19.18	21.05	9.8	22.06	23.67	7.3
Services	13.53	12.76	-5.7	15.89	15.06	-5.2
Primary, processing, machining	18.83	18.25	-3.1	19.64	19.34	-1.5
Construction-related	22.36	21.49	-3.9	23.08	21.86	-5.3
Other occupations	18.95	17.86	-5.7	20.10	19.20	-4.5

Sources: Statistics Canada, 1981 Survey of Work History, 1998 Labour Force Survey, and Consumer Price Index (All-items).

Table 19
Changes in average log wages by occupational group, full-time workers, 1981 to 1998

Occupational group	No controls	Controls for gender, age, education, and seniority	Column 2 plus controls for two-digit industries	Sample size
	Column 1	Column 2	Column 3	Column 4
		number		
Professionals and managers	-0.005	-0.007	-0.007	3,520
Natural and social sciences	0.069 ***	0.012	0.016	11,558
Clerical occupations	0.032 ***	-0.024 ***	-0.009	10,811
Sales	0.079 ***	0.046 ***	0.039 ***	10,524
Services	-0.016	-0.040 ***	-0.004	7,325
Primary, processing, machining	0.001	-0.031 ***	-0.021 **	14,571
Construction-related	-0.037 *	-0.071 ***	-0.064 ***	4,286
Other occupations	-0.043 **	-0.062 ***	-0.061 ***	6,566

Note: †p<0.10; *p<0.05; **p<0.01; ***p<0.001 (two-tailed test).
Sources: Statistics Canada, authors' calculations based on the 1981 Survey of Work History and the 1998 Labour Force Survey.

1998 to 2011

The story for the subsequent years is quite different. As Table 20 shows, managerial occupations registered much higher wage growth than any other occupation from 1998 to 2011: the average wages for this type of occupation increased by 26.9% during that period. None of the broad occupational groups considered in Table 20 experienced a decline in wages during this period. Most displayed average wage growth ranging from 2% to 15%. Along with managers, workers employed in the natural and applied sciences and workers employed in primary industries also displayed relatively strong wage growth (about 14%). In contrast, workers employed in occupations unique to processing, manufacturing, and utilities registered more modest wage growth.

Table 20
Real hourly wages (2010 dollars) of workers in selected occupational groups employed full-time, 1998 to 2011

Occupational group	Median hourly wages			Average hourly wages		
	1998	2011	Change	1998	2011	Change
	Column 1	Column 2	Column 3	Column 4	Column 5	Column 6
	dollars		percent	dollars		percent
Management occupations	24.87	33.50	34.7	27.54	34.95	26.9
Business, finance, and administrative occupations	19.14	19.86	3.8	20.54	21.70	5.7
Natural sciences, applied sciences, and related occupations	26.17	29.79	13.8	27.47	31.37	14.2
Health occupations	22.97	23.84	3.8	23.67	26.27	11.0
Social sciences, education, government service	26.64	27.32	2.5	27.16	28.75	5.9
Sales and service occupations	13.72	14.52	5.9	15.93	16.97	6.5
Trades, transport, and equipment operators	20.42	21.30	4.3	21.05	22.50	6.9
Occupations unique to primary industry	14.04	16.14	15.0	16.65	19.07	14.6
Occupations unique to processing, manufacturing, and utilities	17.03	17.24	1.2	18.44	18.86	2.3

Sources: Statistics Canada, 1998 to 2011 Labour Force Survey and Consumer Price Index (All-items).

Was the strong increase in managers' wages due to some form of upskilling—with job tenure or education levels rising over the period—and to changes in the industry of employment? Table 21 shows that about 40% of the wage growth experienced by those in managerial occupations can be attributed to such compositional effects (columns 1 and 3). Likewise, about 40% of the wage growth observed among workers employed in the natural and applied sciences and in the primary industries—two occupational groups that experienced relatively large increases in wages—can be attributed to similar compositional changes.[41]

41. The relatively strong wage growth in natural and applied sciences is consistent with the high and rising returns in the fields of engineering and mathematics and computer science at the college and university undergraduate levels. See Drewes (2010) and Walters and Frank (2010).

Table 21
Changes in average log wages in selected occupational groups, full-time jobs, 1998 to 2011

Occupational group	No controls	Controls for gender, age, education, and seniority	Column 2 plus controls for two-digit industries	Sample size
	Column 1	Column 2	Column 3	Column 4
		number		
Management occupations	0.234 ***	0.142 ***	0.141 ***	6,717
Business, finance, and administrative occupations	0.055 ***	0.037 ***	0.042 ***	15,742
Natural and applied sciences and related occupations	0.127 ***	0.087 ***	0.087 ***	5,985
Health occupations	0.087 ***	0.068 ***	0.072 ***	5,186
Social sciences, education, government service	0.044 **	0.077 ***	0.076 ***	7,295
Sales and service occupations	0.070 ***	0.047 ***	0.057 ***	16,367
Trades, transport, and equipment operators	0.073 ***	0.073 ***	0.062 ***	15,133
Occupations unique to primary industry	0.134 ***	0.126 ***	0.083 ***	2,973
Occupations unique to processing, manufacturing, and utilities	0.037 **	-0.011	-0.014	6,636

Note: †p<0.10; *p<0.05; **p<0.01; ***p<0.001 (two-tailed test).
Source: Statistics Canada, authors' calculations based on the 1998 to 2011 Labour Force Survey.

Columns 1 and 3 of Table 21 also show that most of the substantial difference in wage growth observed between individuals in managerial occupations, on the one hand, and workers employed in occupations unique to processing, manufacturing, and utilities, on the other, cannot be accounted for by compositional effects. Even after taking account of these compositional effects, average log wages of managers still grew much faster than those of workers in occupations unique to processing, manufacturing, and utilities. This suggests that other factors—such as those mentioned above as well as specific factors putting downward pressures on the wages of workers employed in occupations unique to processing, manufacturing, and utilities—underlie most of the difference in wage growth observed between these two occupational groups from 1998 to 2011.

8 Conclusion

This study examined how real wages of Canadian workers evolved from 1981 to 2011.

Although women today still earn less than men on average, the gender hourly wage gap decreased significantly over the last three decades. During that period, women increased their productivity-enhancing characteristics at a faster pace than men did. Virtually all of the decline in the gender wage gap over the 1981-to-1998 period can be accounted for by this process. During the more recent period, 1998 to 2011, differential changes in education, job tenure, occupation, and union status accounted for about half of the narrowing of the gap.

From 1981 to 1998, average wages of men and women aged 45 to 54 grew roughly 20 percentage points faster than those of their counterparts aged 25 to 34. Differential changes in unionization, job tenure, industry of employment, and occupation explain about 40% of this difference for men and about 80% of it for women. In contrast, men and women aged 25 to 34 experienced faster wage growth than their counterparts aged 45 to 54 from 1998 to 2011. Changes in unionization, industry of employment, and occupation tended to favour young

workers (relative to older ones) during that period and account for most of the difference in wage growth observed across age groups during that period. Over the entire 1981-to-2011 period, average wages of workers aged 25 to 34 grew by at least 15 percentage points less than those of workers aged 45 to 54.

After growing from 1980 to 2000, the wage gap between university- and high-school-educated individuals decreased from 2000 to 2011, especially among workers under age 35. This decline was driven by more rapidly rising wages among the less-educated, a reversal of the trend in earlier decades. The narrowing of the gap was associated with a shift in labour demand towards industries, such as mining, oil and gas extraction, and construction, which are less intensive users of highly-educated workers. Nevertheless, highly-educated workers today still earn much more, on average, than their less-educated counterparts.

Wage growth varied significantly across industries over the last 30 years. Most notably, the finance sector experienced much faster wage growth than other sectors during the 1981-to-1998 period. Most of this sector's wage growth was related to changes in the worker characteristics and occupations used in the sector, as upskilling appeared to be taking place. About one-half of the differences in wage growth between finance and construction—the sector that experienced the largest decline in wages during that period—was attributable to the more rapid acquisition in the finance sector of attributes associated with higher wages.

Movements in industry-level wages were also quite different during the 1998-to-2011 period. Unlike in the earlier period, during which few industries posted robust wage growth, several industrial sectors experienced close to two-digit wage growth after 1998. Wages in the resource sector (mining and petroleum) grew the fastest, and virtually none of this growth was related to changes in worker or job characteristics. In contrast, the retail trade sector experienced weaker wage growth. Between 1981 to 2011, pay rates in this sector changed little.

Finally, wage growth varied little across broad occupational groups from 1981 to 1998. However, during the first decade of this century, average wage growth for managerial occupations exceeded that observed in other aggregate occupational groups by a substantial margin. About 40% of the wage growth in managerial occupations between 1998 and 2011 was due to changes in attributes associated with higher wages. Even after such changes were accounted for, managers continued to register the highest wage growth. Furthermore, only about one-quarter of the difference in wage growth between managers and workers in processing/manufacturing/utilities was attributable to changes in worker or job characteristics over the period. This suggests that other factors appear to be driving the relatively rapid wage growth among managers. Quantifying the contribution of these factors is an area for future research.

9 Appendix

9.1 Wage and hours concepts used in household surveys, 1981 to 2011

Wage concept

1981 Survey of Work History (SWH): *usual* wage or salary before taxes and other deductions; no reference is made to tips, commissions, bonuses, or overtime

1984 Survey of Union Membership (SUM): *usual* wage or salary before taxes and other deductions; no reference is made to tips, commissions, bonuses, or overtime

1986 Labour Market Activity Survey (LMAS): *usual* wage or salary before taxes and other deductions; no reference is made to tips, commissions, bonuses, or overtime

1987 to 1990 Labour Market Activity Survey (LMAS): *usual* wage or salary before taxes and other deductions; includes tips, commissions, bonuses, and paid overtime—all together

1997 to 2011 Labour Force Survey (LFS): wage or salary before taxes and other deductions, including tips and commissions; whether respondents include overtime pay is unclear

Hours concept

1981 Survey of Work History (SWH): *usual* days per week + *usual* hours per day; no reference is made to overtime

1984 Survey of Union Membership (SUM): weeks worked in 1984 + *usual* hours per day; no reference is made to overtime

1986 Labour Market Activity Survey (LMAS): *usual* paid days per week + *usual* paid hours per day; no reference is made to overtime

1987 to 1990 Labour Market Activity Survey (LMAS): *usual* paid days per week + *usual* paid hours per day; no reference is made to overtime

1997 to 2011 Labour Force Survey (LFS): *usual* paid hours per week; explicitly excludes overtime

9.2 The wage gap between men and women in recent years

This appendix highlights two key findings. First, it shows that, among full-time workers aged 17 to 64 who were employed in broadly comparable industries and occupations, women's wages amounted to 92% of men's wages in 2011. Among full-time workers aged 25 to 54, the corresponding number is 91%.

Second, it shows that using a detailed set of industry and occupation controls allows one to explain a larger fraction of the gender wage gap in 2008 than is explained by Baker and Drolet (2010) using less detailed controls. While Baker and Drolet (2010) were able to explain 16% of the log wage gap observed between men and women aged 25 to 54 who were employed full-time in 2008, using a detailed set of industry and occupation controls allows one to explain 37% of this gap. The implication is that—while Baker and Drolet (2010) suggest that, among full-time workers aged 25 to 54 who were employed in broadly comparable industries and occupations, women's wages amounted to 85% of men's wages in 2008—using a detailed set of industry and occupation controls raises this number to 89%. The difference in estimates is due largely to the fact that the broad occupational codes used by Baker and Drolet (2010) suggest—surprisingly—that women are over-represented in high-paying occupations while detailed occupational codes suggest the opposite, i.e., that women are still over-represented in low-paying occupations.

9.2.1 The gender wage gap in broadly comparable industries and occupations in 2011

Table 22 is based on equation (2) of Baker and Drolet (2010, p. 447). It shows that, in 2011, the gender log wage gap amounted to 0.129 (roughly 13%) among full-time workers aged 17 to 64. Almost half of this gap can be explained by the fact that women are over-represented in low-paying industries and occupations. The unexplained component amounts to 0.076, i.e., roughly 8% [exp(0.076)-1], thereby implying that, in broadly comparable industries and occupations, women's wages amounted to 92% of men's wages in 2011. A similar exercise performed for full-time workers aged 25 to 54 yields an unexplained component of 0.087, i.e., roughly 9% [exp(0.087)-1]. This implies that, among full-time workers aged 25 to 54 employed in broadly comparable industries and occupations, women's wages amounted to 91% of men's wages in 2011.

Table 22
Blinder-Oaxaca decomposition of the gender log wage gap in 2011, full-time workers

	Workers aged 17 to 64		Workers aged 25 to 54	
	Column 1	Column 2	Column 3	Column 4
	number	percent	number	percent
Gender log wage gap	0.129	100.0	0.134	100.0
Portion explained by				
Age	-0.002	-1.2	-0.001	-0.6
Education	-0.007	-5.7	-0.008	-6.1
Province	0.003	2.0	0.003	2.3
Union status	-0.004	-3.5	-0.005	-3.8
Marital status	0.000	0.2	0.000	0.0
Tenure	-0.003	-2.6	-0.004	-2.7
Occupation	0.039	30.1	0.033	24.5
Industry	0.028	21.7	0.029	21.9
Total portion explained	0.053	41.1	0.047	35.4
Portion unexplained	0.076	58.9	0.087	64.6

Source: Statistics Canada, authors' calculations based on the 2011 Labour Force Survey.

9.2.2 The effect of using detailed occupation codes

Because they wished to use consistent industry and occupation codes over the 1981-to-2008 period and because industry and occupation classifications underwent significant changes during this period, Baker and Drolet (2010) were forced to use fairly broad occupation controls when they conducted their regression analyses (See the appendix in Baker and Drolet, p. 455–464). In contrast, this study uses 47 occupation controls (along with 23 industry controls) when accounting for the gender wage gap. As Table 23 shows, using detailed occupation controls has two major impacts. First, it allows one to explain a larger fraction (37%, or 0.062/0.166) of the wage gap than that explained by Baker and Drolet (2010) (16%, or 0.026/0.166). Second, it suggests that, contrary to the findings of Baker and Drolet (2010, Table 5, p. 449), women are still over-represented in low-paying occupations. In fact, 17% (0.029/0.166) of the gender log wage gap can be accounted for by this fact. In contrast, the negative estimate of -0.023 obtained by Baker and Drolet (2010) suggests that women are over-represented in high-paying occupations.

Table 23
The gender log wage gap in 2008, full-time workers aged 25 to 54

	Log wage gap	Explained component	Contribution of differences in			Unexplained component
			Education	Occupation	Industry	
			number			
Baker and Drolet (2010, Table 5)	0.166	0.026	-0.009	-0.023	0.065	0.141
Detailed industry and occupation codes	0.166	0.062	-0.007	0.029	0.045	0.105

Note: The explained and unexplained components do not sum to the log wage gap as a result of rounding.
Sources: Baker, M., and M. Drolet, 2010, Table 5; Statistics Canada, authors' calculations based on the 2008 Labour Force Survey.

Table 24
Real hourly wages (2010 dollars) of men and women aged 25 to 54 employed full-time, 1981 to 2011

	Median hourly wages			Average hourly wages		
	Men	Women	Column 2 divided by Column 1	Men	Women	Column 5 divided by Column 4
	Column 1	Column 2	Column 3	Column 4	Column 5	Column 6
	dollars		ratio	dollars		ratio
Year						
1981	22.57	16.92	0.750	24.01	18.48	0.770
1984	24.03	17.46	0.726	25.10	18.63	0.742
1986	23.19	17.51	0.755	24.68	18.40	0.746
1987	23.57	17.13	0.727	24.68	18.74	0.759
1988	23.66	17.34	0.733	25.25	19.18	0.760
1989	23.36	17.37	0.743	24.79	18.98	0.766
1990	22.96	17.46	0.761	24.51	19.01	0.776
1997	22.68	18.58	0.819	24.17	19.96	0.826
1998	22.82	18.40	0.806	24.22	19.99	0.825
1999	22.57	18.81	0.833	24.43	20.06	0.821
2000	23.20	18.67	0.805	24.54	20.20	0.823
2001	22.91	18.82	0.822	24.95	20.40	0.818
2002	22.83	18.90	0.828	24.76	20.64	0.834
2003	22.67	19.05	0.841	24.51	20.66	0.843
2004	22.25	18.95	0.852	24.76	20.91	0.844
2005	22.59	19.14	0.847	24.52	21.04	0.858
2006	23.00	19.22	0.836	25.20	21.32	0.846
2007	22.99	19.52	0.849	25.31	21.64	0.855
2008	23.48	20.00	0.852	25.92	21.91	0.845
2009	24.44	20.46	0.837	26.55	22.97	0.865
2010	24.04	20.77	0.864	26.52	23.06	0.869
2011	23.63	20.33	0.861	26.14	22.78	0.871
			percent change			
Period						
1981 to 2001	1.5	11.2	...	3.9	10.4	...
2001 to 2011	3.1	8.0	...	4.8	11.7	...
1981 to 2011	4.7	20.2	...	8.9	23.3	...
1981 to 1998	1.1	8.7	...	0.9	8.2	...
1998 to 2011	3.6	10.5	...	8.0	14.0	...

Sources: Statistics Canada, 1981 Survey of Work History, 1984 Survey of Union Membership, 1986 to 1990 Labour Market Activity Survey, 1997 to 2011 Labour Force Survey, and Consumer Price Index (All-items).

Table 25
Dynamic Blinder-Oaxaca decompositions of the change in the age log wage gap

	Men aged 17 to 24 versus men 55 to 64		Women aged 17 to 24 versus women 55 to 64	
	Column 1	Column 2	Column 3	Column 4
	number	percent	number	percent
1981-to-1998 change in the age log wage gap	0.371	100.0	0.229	100.0
Portion explained by				
Education	0.007	2.0	0.003	1.5
Province	-0.002	-0.6	-0.009	-4.0
Union status	0.024	6.5	0.021	9.4
Marital status	0.012	3.4	0.002	0.9
Tenure	0.016	4.4	0.043	19.0
Occupation	0.023	6.3	0.043	18.6
Industry	0.012	3.1	0.047	20.5
Total portion explained	0.093	24.9	0.150	65.7
Portion unexplained	0.278	75.1	0.079	34.3

Sources: Statistics Canada, authors' calculations based on the 1981 Survey of Work History and the 1998 Labour Force Survey.

References

Alexopoulos, M. 2001. *Efficiency Wages and Inter-Industry Wage Differentials*. Toronto, Ontario. Department of Economics, University of Toronto. Manuscript.

Baker, M., D. Benjamin, A. Desaulniers, and M. Grant. 1995, "The distribution of the male/female earnings differential, 1970-1990." *Canadian Journal of Economics*. Vol. 28. No. 3. p. 479–501.

Baker, M., and M. Drolet. 2010. "A New View of the Male/Female Pay Gap." *Canadian Public Policy*. Vol. 36. No. 4. p. 429–464.

Beaudry, P., and D.A. Green. 2000. "Cohort Patterns in Canadian Earnings: Assessing the Role of Skill Premia in Inequality Trends." *Canadian Journal of Economics*. Volume 33. No. 4. p. 907–936.

Beaudry, P., D.A. Green, and B. Sand. 2011. "Does Industrial Composition Matter for Wages? A Test of Search and Bargaining Theory." *Econometrica*. Forthcoming.

Boudarbat, B., T. Lemieux, and W.C. Riddell. 2010. "The Evolution of the Returns to Human Capital in Canada, 1980–2005." *Canadian Public Policy*. Vol. 36. No. 1. p. 63–89.

Burbidge, J.B., L. Magee, and A.L. Robb. 2002. "The Education Premium in Canada and the United States." *Canadian Public Policy*. Vol. 28. No. 2. p. 203–217.

Card, D., and J. DiNardo. 2006. "The Impact of Technological Change on Low-Wage Workers: A Review." *Working and Poor: How Economic and Policy Changes Are Affecting Low-Wage Workers*. R.M. Blank, S.H. Danziger, and R.F. Schoeni (eds.). New York. Russell Sage Foundation. The National Poverty Center Series on Poverty and Public Policy. Chapter 4. p. 113–140.

Cranford, C.J., L.F. Vosko, and N. Zukewich. 2003. "Precarious Employment in the Canadian Labour Market: A Statistical Portrait." *Just Labour*. Vol. 3. p. 6–22.

Dickens, W., and L. Katz. 1987. "Inter-Industry Wage Differentials and Industry Characteristics." *Unemployment and the Structure of Labor Markets*. K. Lang and J.S. Leonard (eds.). New York. Basil Blackwell Inc. p. 48–89.

Doiron, D.J., and W.C. Riddell. 1994. "The Impact of Unionization on Male-Female Earnings Differences in Canada. *Journal of Human Resources*. Vol. 29. No. 2. Special Issue: Women's Work, Wages, and Well-Being. p. 504–534.

Drewes, T. 2010. *Postsecondary Education and the Labour Market in Ontario*. Toronto, Ontario. Higher Education Quality Council of Ontario. Commissioned report.

Drolet, M. 2002. "New Evidence on Gender Pay Differentials: Does Measurement Matter?" *Canadian Public Policy*. Vol. 28. No. 1. p. 1–16.

Fortin, N., T. Lemieux, and S. Firpo. 2011. "Decomposition Methods in Economics." *Handbook of Labor Economics*. O. Ashenfelter and D. Card (eds.). Amsterdam, North-Holland. Elsevier. Vol. 4A. Chapter 1. p. 1–102.

Fortin, N., and T. Schirle. 2006. "Gender Dimensions of Changes in Earnings Inequality in Canada." *Dimensions of Inequality in Canada*. D.A. Green and J.R. Kesselman (eds.). Vancouver, British Columbia. UBC Press.

Freeman, R.B., and K. Needels. 1993. "Skill Differentials in Canada in an Era of Rising Labor Market Inequality." *Small Differences That Matter: Labour Markets and Income Maintenance in Canada and the United States*. D. Card and R.B. Freeman (eds.). The National Bureau of Economic Research. Chicago, Illinois. University of Chicago Press. p. 45–68.

Gera, S., and G. Grenier. 1994. "Inter-industry Wage Differentials and Efficiency Wages: Some Canadian Evidence." *Canadian Journal of Economics*. Vol. 27. No. 1. p. 81–100.

Grey A. 1993. "Inter-industry Wage Differentials in Manufacturing: Rents and Industry Structure." *Canadian Journal of Economics*. Vol. 26. No. 3. p. 525–535.

Gunderson, M. 1979. "Decomposition of the Male/Female Earnings Differential: Canada 1970." *Canadian Journal of Economics*. Vol. 12. No. 3. p. 479–485.

Katz, L.F., and D.H. Autor. 1999. "Changes in the Wage Structure and Earnings Inequality." *Handbook of Labor Economics*. O. Ashenfelter and D. Card (eds.). Amsterdam, North-Holland. Elsevier. Vol. 3A. Chapter 26. p. 1463-1555.

Katz, L.F., and K.M. Murphy. 1992. "Changes in Relative wages, 1963-1987: Supply and Demand Factors." *Quarterly Journal of Economics*. Vol. 107. No. 1. p. 35–78.

Krueger A.B., and L.H. Summers. 1988. "Efficiency Wages and the Inter-Industry Wage Structure." *Econometrica*. Vol. 56. No 2. p. 259–293.

Lemieux, T. 2008. "The Changing Nature of Wage Inequality." *Journal of Population Economics*. Vol. 21. No. 1. p. 21–48.

Mishel, L., J. Bernstein, and H. Shierholz. 2009. *The State of Working America 2008/2009*. Ithaca, New York. Economic Policy Institute, Cornell University.

Morissette, R. 1998. "The declining labour market status of young men." *Labour Markets, Social Institutions, and the Future of Canada's Children*. Miles Corak (ed.). Statistics Canada Catalogue no. 89-553-XIB. Ottawa, Ontario. Chapter 3. p. 31–50.

Morissette, R. 2008. "Earnings in the Last Decade." *Perspectives on Labour and Income*. Vol. 9. No. 2. Statistics Canada Catalogue no. 75-001-X. p. 12–24.

Morissette, R., and A. Johnson. 2005. "Are Good Jobs Disappearing in Canada?" *Economic Policy Review*. New York. Federal Reserve Bank of New York. Vol. 11. No. 1. p. 23–56.

Morissette, R., and Y. Ostrovsky. 2006. *Pension Coverage and Retirement Savings of Canadian Families, 1986 to 2003*. Statistics Canada Catalogue no. 11F0019M. Ottawa, Ontario. Analytical Studies Branch Research Paper Series. No. 286.

Morissette, R., Y. Ostrovsky, and G. Picot. 2006. "Relative Wage Patterns Among the Highly Educated in a Knowledge-Based Economy." *Services Industries and the Knowledge-Based Economy*. R.G. Lipsey and A.O. Nakamura (eds.). Calgary, Alberta. University of Calgary Press. Chapter 5. p. 131-158.

Murphy, K.M., W.C. Riddell, and P.M. Romer. 1998. "Wages, Skills, and Technology in the United States and Canada." *General Purpose Technologies and Economic Growth*. E. Helpman (ed.). Cambridge, Massachusetts. The MIT Press. Chapter 11. p. 283–310.

Murphy, K.M., and R.H. Topel. 1987. "Unemployment, Risk, and Earnings." *Unemployment and the Structure of Labor Markets*. K. Lang and J.S. Leonard (eds.). New York. Basil Blackwell Inc. p. 103–140.

Philippon, T., and A. Reshef. 2007. *Skill Biased Financial Development: Education, Wages and Occupations in the U.S. Financial Sector.* Cambridge, Massachusetts. National Bureau of Economic Research. NBER Working Paper Series. No. 13437.

Picot, G. 1998. *What is Happening to Earnings Inequality and Youth Wages in the 1990s?* Statistics Canada Catalogue no. 11F0019M. Ottawa, Ontario. Analytical Studies Branch Research Paper Series. No. 116.

Piketty T., and E. Saez. 2006. "The Evolution of Top Incomes: A Historical and International Perspective." *American Economic Review.* Vol. 96. No. 2. p. 200–205.

Plummer, T., and M. Shannon. 2011. *Wage Trends from the Canadian Labour Force Survey 1997-2011.* Thunder Bay, Ontario. Lakehead University. Discussion paper.

Walters, D., and K. Frank. 2010. *Exploring the Alignment between Postsecondary Education Programs and Labour Market Outcomes in Ontario.* Toronto, Ontario. Higher Education Quality Council of Ontario. Commissioned report.